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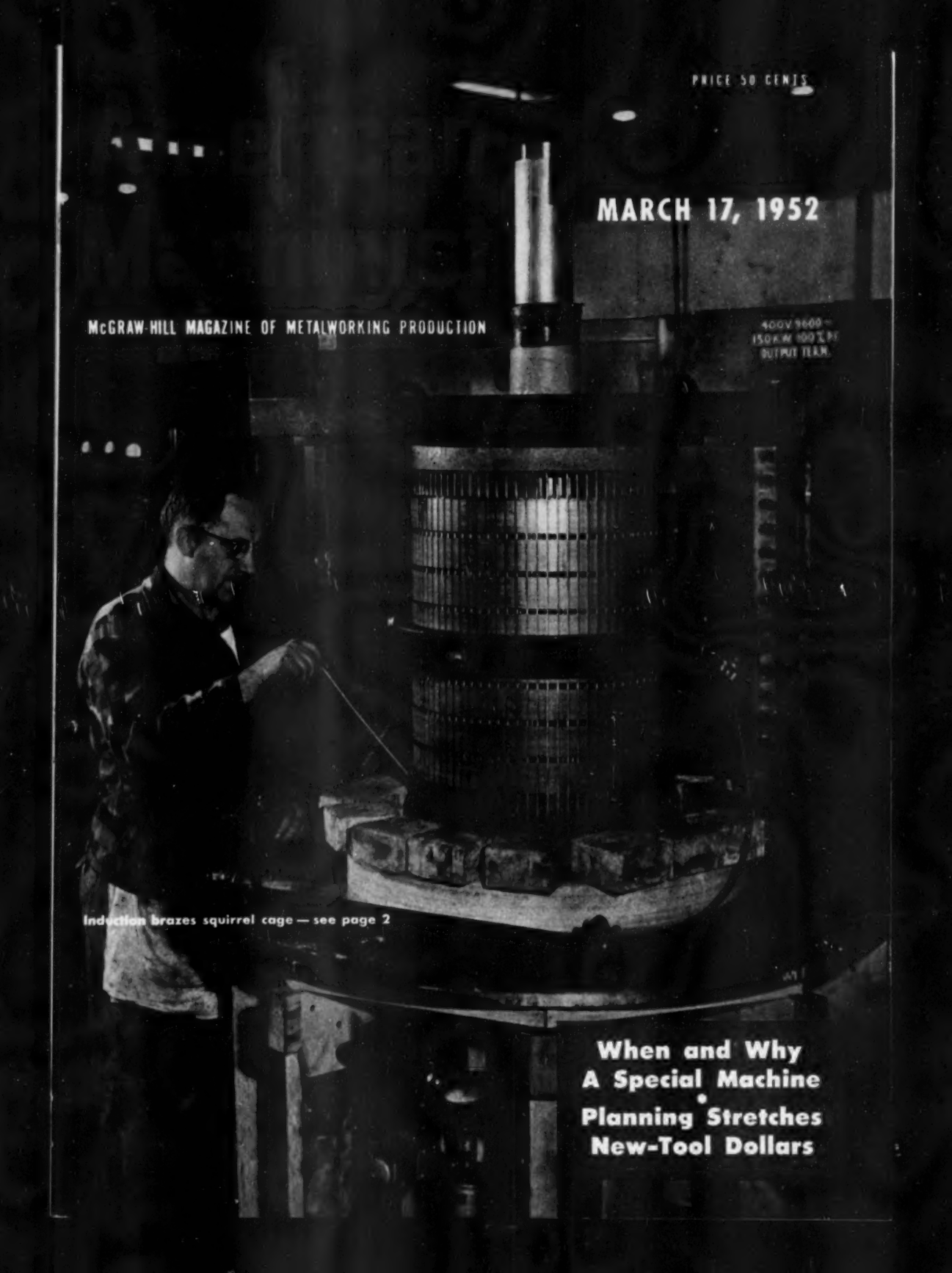
MARCH 17, 1952

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

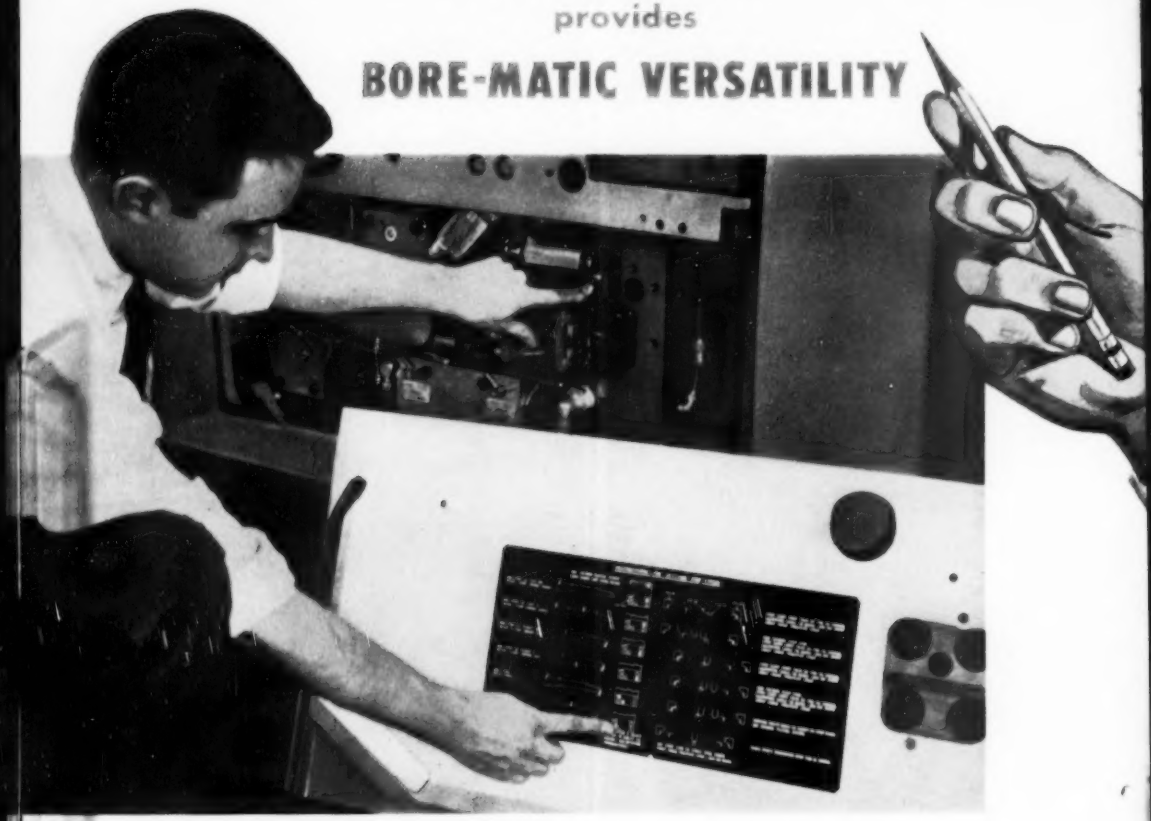


Induction brazes squirrel cage — see page 2

When and Why A Special Machine

Planning Stretches New-Tool Dollars

Here's How Heald provides BORE-MATIC VERSATILITY



The Automatic Cycles on your Heald Bore-Matic can easily be changed without additional equipment

Webster defines the word *versatile* as follows: "Turning with ease from one thing to another; having aptitude for new tasks." That's exactly what is meant by the versatility of a Heald Bore-Matic. Although normally supplied for a specific job, each machine is designed to permit the use of several basic machine cycles. Conversion from one cycle to another is simply a matter of turning a knob, changing the position of a screw, and readjusting the table cams and dogs. Instructions for making these changes are included on the inside of the control panel cover as shown above.

If you have a changeover problem, just call your Heald representative. His most important job right now is helping you *get the most* out of your Heald equipment.

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

CONTENTS for MARCH 17, 1952

VOL. 96, No. 6

ADMINISTRATION

Editorial ..... *Burnham Finney* 117
Planning Stretches New-Equipment Dollars ..... *H. H. Beaudet* 119
Pointing the Way To Continuing Prosperity 150A
Last of the Mechanics ..... *Round Table* 151

SPECIAL REPORT

How Ford Automates Production Lines ..... *Rupert Le Grand* 135

ASSEMBLY

Induction Brazes Squirrel Cage .... *P. H. Brace & E. B. Fitzgerald* 124

ENGINEERING

When and Why a Special Machine? ..... *C. P. Farr* 126
New Processes Will Machine the "Unmachinable" 130

INSPECTION

Indicator Gage Checks Machine Dovetails .... *Fred H. Lingenfelder* 156
Indicator Attachment Checks Extra Dimension ..... *R. H. Fry* 157

MATERIAL CUTTING, FORMING

Hot Platen Simplifies Forming Magnesium ..... *Frank Charity* 123
How to Roll Back Forming Costs ..... *A. F. Schub* 152
Shop Shots 134
Turret Slide and Miller Cut Cams ..... *Allan Clarke* 154

TOOLING

Diemakers' Kinks ..... *Federico Strasser* 153
Screw-Clamped Fixture Has Fast Action ..... *Tom Brown* 154
Punch Table Simplifies Notching ..... *Pablo Redl* 155
Carbide Toolbit Reground Only on Top ..... *J. M. Askin* 155
Sine Bar With Lever Corrects Compound Angles ..... *R. G. Vare* 155
Welded Lathe Tools Make Flycutters ..... *Allan Clarke* 156
Attachment Feeds Grinder on Lathe ..... *Frederick C. Lurz* 156
Boring Tools Made From Old Drills, Reamers .. *George J. Van Hecke* 157
Six-Station Table Is Easily Built ..... *J. C. Salinas* 157
Tailstock Center Is Spring-Loaded ..... *Pierre Wilmus* 158
Multi-Jaw Chuck Adapted for Holding Odd Shapes .... *R. G. Vare* 158
Drill Speed and Feed Charts ..... *J. H. Landvater (RBS)* 161

NEWS OF METALWORKING

Spot News 103
Washington 105
Detroit 107
Machine Tools 109
Gaging Metalworking 113
Names in the News 173

DEPARTMENTS

Backlash 96
Reference Book Sheets 161
Talking Shop 167
Equipment, Materials, Parts .. 174
Round Table Discussion 210
New Books 242
Subcontracting News 219

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Chips and QUIPS

Induction Brazing . . . Our cover Kodachrome shows the new Westinghouse setup for brazing copper rotor bars to the end rings of squirrel-cage motors. This was formerly a difficult, slow job; now it's a 4-min automatic operation. Details of the process are given in a 2-page article in this issue, written by P H Brace and E R Fitzgerald of Westinghouse, and completely illustrated.

Automation Again . . . Associate Editor Le Grand has been digging deep at the new Ford Cleveland Engine Plant and has written a 16-page analysis of design features of the several kinds of automating devices installed there. Included are text, photos, and how-they-work sketches to show how various kinds of parts are moved into and out of machine tools, furnaces, washers, and inspection machines in timed sequence. In building the new overhead-valve six with "no hands," Ford is saving 30% in direct labor and getting a higher production rate.

Special Machines . . . C P Farr, chief engineer of Modern Tool Works, Inc, Toronto, Canada, has provided us with pictures and comments on a number of recent and interesting special machines. He uses these examples to indicate the four reasons for a special machine—when, where, and why.

Pix . . . Among picture groups included in this issue is a group of four from Canadian GE at Montreal, showing a variety of jobs north of the border.

Reaction . . . Modern readers don't write the magazine; they write the author direct—if his address is provided. Two recent examples: About three years ago, we described an imported German cutting-fluid additive, Emulphor-STH. General Aniline & Film had something over 500 letters to answer, is still receiving them. More recently, E Von Hambach's article on high-speed machining of stainless (*AM*, Jan 7) has swamped him with letters, telegrams.

Budgeted Buying . . . Draper Corporation, Hopedale, Mass., has developed plant-wide planning to stretch new-equipment dollars. Associate Editor Rowan describes how the annual equipment budget is based on a company-wide survey, continuous methods-improvement work, and an analysis procedure based upon the MAPI formula. Several examples of improved equipment are included. Last year's budget for equipment was about $4 million, with more than $1 million to machine tools alone.

Index Statistics . . . Our indexer reports that we published 951 articles in 1951, as compared with 916 in 1950. They came from 368 different authors.

Arcs . . . Just as we were closing this issue, a report we've been waiting for was released by the National Research Council. We've rushed the gist of it into print: see "New Processes." It covers arc and ultrasonic machining.

Hot Platen . . . The Guerin process can be applied in forming of magnesium-alloy sheet by using a lower press platen cored for heating by any desired method. Frank Charity describes how the job is done on the West Coast . . . Also from the West Coast, and on forming, is a story by A F Schub of Douglas Aircraft, which describes roll-forming of aluminum strip in small quantities. Press brakes weren't accurate enough for the job, so wood and metal rolls were tried, finally replaced by a laminated plastic of special composition.

Coming . . . March 31 *AM* will feature an expensive little bit of steel and describe how it's made. There'll be a Special Report on How to Work Beryllium-Copper Strip and articles on 8 ways to grind machine-tool ways, a master panelling fixture, intricate weldments, standard die plates, a special broaching job, and the story of a seagoing lathe—plus usual departments.

STANDARD SPECIALIST . . . Born and educated in Hamilton, Ont., technical graduate engineer in tool design, applied hydraulics, and machine design, Clifford P. Farr obtained his early practical experience in the automotive industry in Canada. At the outbreak of World War II, he headed the Tool Engineering Division of Victory Aircraft Ltd. In 1942, he joined the staff of the S F Bowser Corp as supt of mfg methods and tool design, Instrument Division, engaged in producing naval and aircraft gun-fire control apparatus. Since 1945, he has been chief engineer for Modern Tool Works Ltd. He is currently vice chairman of the Toronto Chapter, ASTE, and member of Specification Committee, Canadian Standards Assn. He draws from his experience in designing standard and special-purpose machines in this issue.

ROUGHING

When your straight bevel gear production requires more equipment, the No. 7 Revex Rougher gives you rapid, close roughing of tooth taper and profile shape more rapidly . . . frees your No. 14 Straight Bevel Generator from roughing so that full production time can be used for finishing . . . leaves little metal for finishing tools to remove . . . tools last longer, thus providing a superior quality in the completed gear.

PAIRED FOR PRODUCTION

FINISHING

The Gleason No. 14 Straight Bevel Generator is completely universal for roughing or finishing. When production requirements increase, it is also the ideal machine for finishing only. Production schedules for producing quality Coniflex gears can easily be maintained when these two machines are paired for high production.

BUILDERS OF BEVEL GEAR MACHINERY · FOR OVER EIGHTY-FIVE YEARS · GLEASON

GLEASON WORKS

1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

No handling
Continuous production ultra-precision

Tandem setups for continuous thrufeed centerless grinding operations are well known to the high production industries. But not so well known is the latest method of harnessing CINCINNATI FILMATIC Centerless Grinders together to simplify sizing adjustments and resetting. It works this way:

A Feedmatic Hopper automatically loads the work in the first machine. Thereafter, individually motor driven conveyors take over. They are mounted on the machines at the entrance side of the grinding throat and freely supported at the rear of the preceding machine. As the work leaves one machine, it is dropped on the conveyor for the next machine by a counterweighted escape device. Thus each unit can be individually adjusted without affecting the others, and it is unnecessary to maintain a straight line laterally.

To improve surface finish beyond the best obtainable by grinding, a CINCINNATI FILMATIC Centerless Lapping Machine can be placed at the end of the line of Centerless Grinders, as has been done in the production line illustrated. Setups of this type produce exceptionally high-quality work, with very little attention from the operator at each end of the line. ¶ CINCINNATI FILMATIC Centerless Grinders offer many advantages for continuous line production or job lots. FILMATIC grinding wheel spindle bearings will never fail; lubrication, including the infeed slides, is automatic; electrical control elements are built-in. And, to top it off, Cincinnati Application Engineers will be glad to help you with your high priority production problems.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

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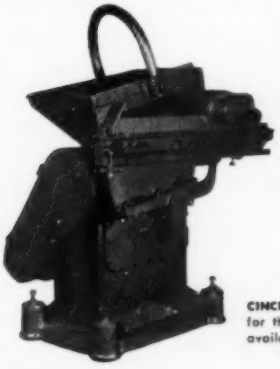
problem here... setup grinds and laps work

Grinding rocker arm shafts, 16¾" long; removing .015" to .020" stock on 170 shafts per hour. Shafts are selectively hardened, and delivered to the grinder in varying degrees of straightness. The production line consists of five CINCINNATI FILMATIC No. 2 Centerless Grinders and one CINCINNATI FILMATIC Centerless Lapping Machine.

CINCINNATI FILMATIC No. 2 Centerless Grinder. Complete specifications may be obtained by writing for catalog No. G-611.



CINCINNATI Feedmatic Hopper. Type E illustrated for thrufeed work. Type B, for infeed work, also available. Catalog No. G-575-1.

CINCINNATI

FILMATIC

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Superior Quality

Total Indicator Reading .0005" on pitch line runout
Locating Faces Square with hole within .0002"
P.L. Diameter 2" +.0000" —.0005" over wires
Assembled to run with .001" max. eccentricity

BY SUPERIOR

Often in these times, there is need for gears beyond the normal possibilities of so-called mass production.

Happily, though, there are shops where scant tenths-of-a-thousandth are considered generous tolerances—shops where super-precision gear cutting is still traditionally a matter of personal pride with the men who meticulously prepare the blanks and closely supervise the cutting of the teeth.

Fellows is pleased to have just such a customer in Haxton Gears, Inc. of East Rockaway, L. I., New York—and pleased, also, to show the industry these photographic glimpses of their precision work in progress, with the results achieved. If you have quality gears to tool up for, an engineer from the Fellows office nearest you can discuss methods, tooling and costs on a practical basis.

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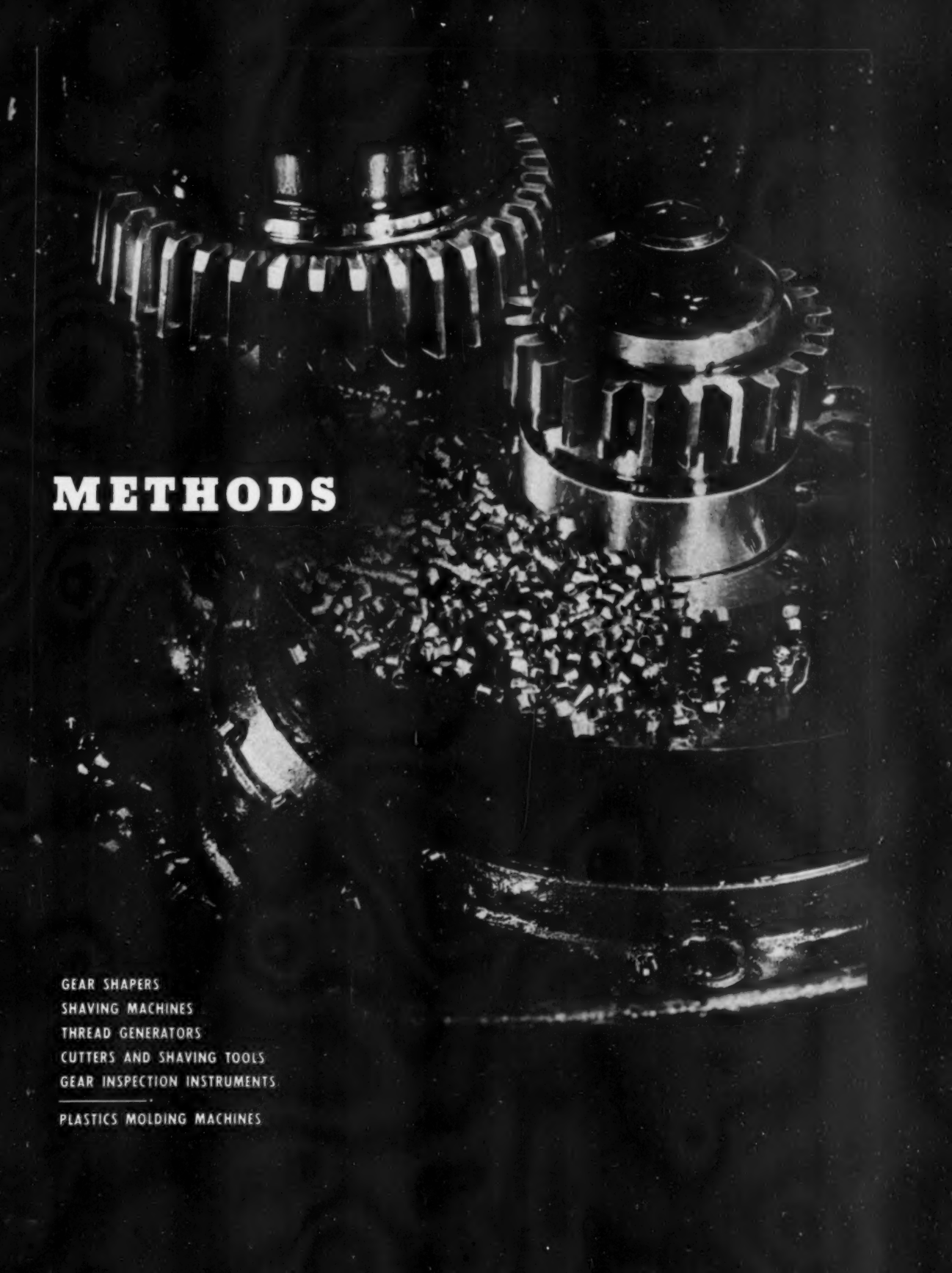


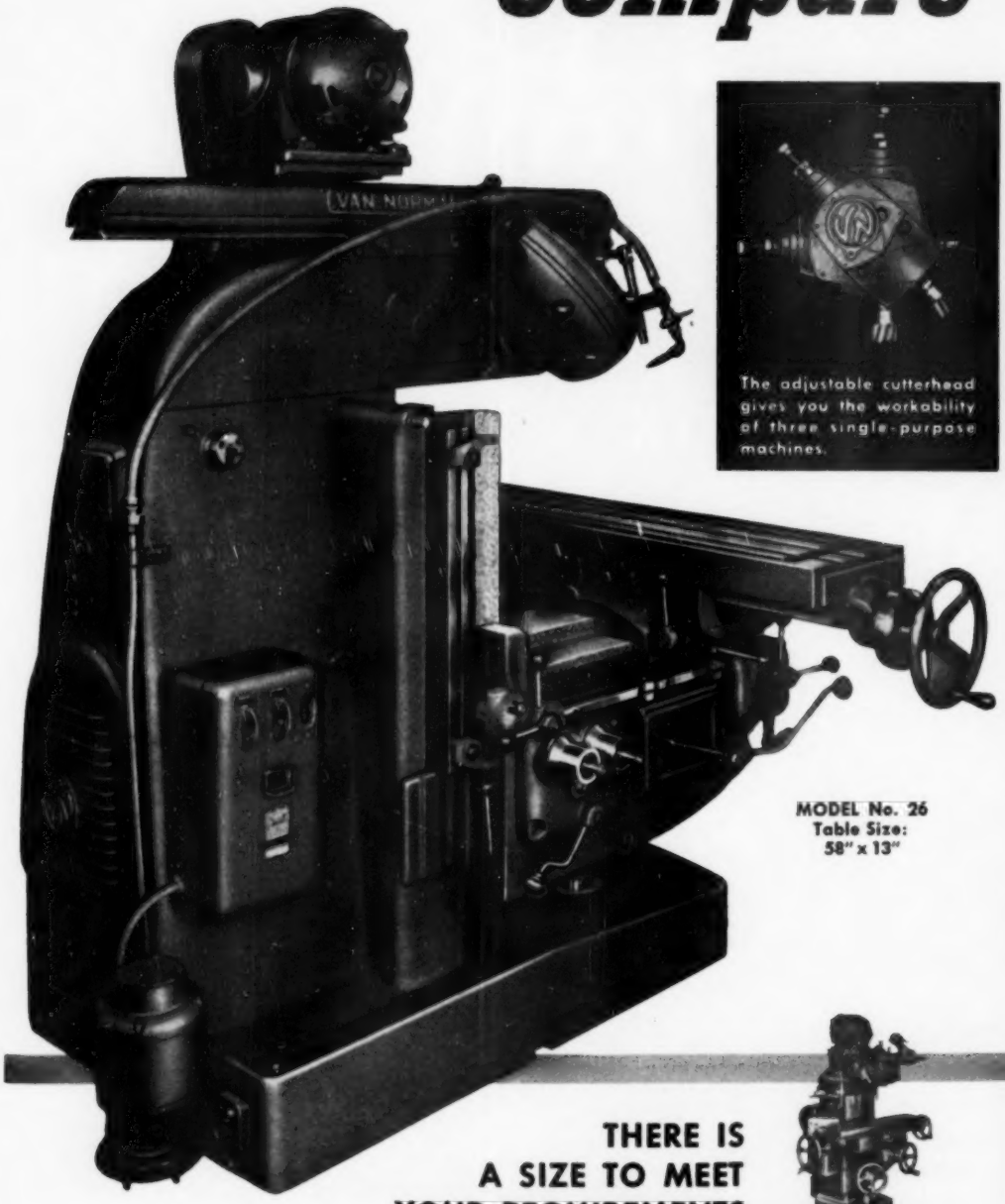
METHODS

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

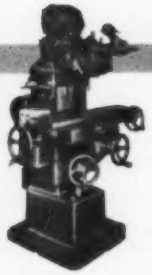
Compare

The adjustable cutterhead gives you the workability of three single-purpose machines.



MODEL No. 26
Table Size:
58" x 13"

THERE IS A SIZE TO MEET YOUR REQUIREMENTS



No. 12 — Table: 37½" x 9 3/16"

the Advantages

of VAN NORMAN Ram-Type Milling Machines

They Mean More Production... Lower Costs

Van Norman Ram-Type Millers give you many advantages over single-purpose machines that can help you speed up production and reduce milling costs. With these millers you can do horizontal, vertical, or angular milling, all on one machine. They reduce idle machine and operator time and increase output. Compare the advantages listed against any other miller—

1. **Adjustable Cutterhead permits you to do the work of three single-purpose machines . . . conventional horizontal, vertical or angular milling.**

2. **Movable Ram plus the saddle crossfeed increases the work range and capacity of the miller... enables you to handle larger work pieces with ease.**

3. **Front and rear controls on miller sizes 22L and larger permit ease of operation, eliminate back and forth operator walking... reduces operator fatigue.**

4. **Quick change speed and feed selectors enable the operator to select the proper cutting speed and feed best suited for each job.**

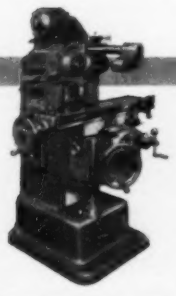
5. **Large, easy to read dials make manual adjustments and work setups easy.**

6. **Rugged base and column, massive cutterhead, large ram and heavy knee, saddle and table assembly provide maximum rigidity and long life accuracy.**

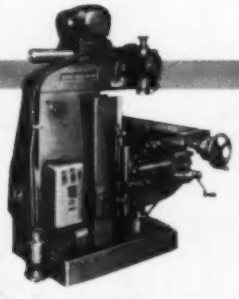
Investigate Van Norman Ram-Type Millers today. Write for bulletin.

VAN NORMAN COMPANY

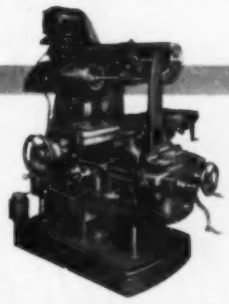
SPRINGFIELD 7, MASSACHUSETTS



No. 16 — Table: 37" x 9½"



No. 22-L — Table: 45" x 10"



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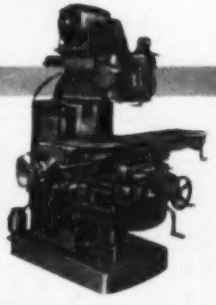


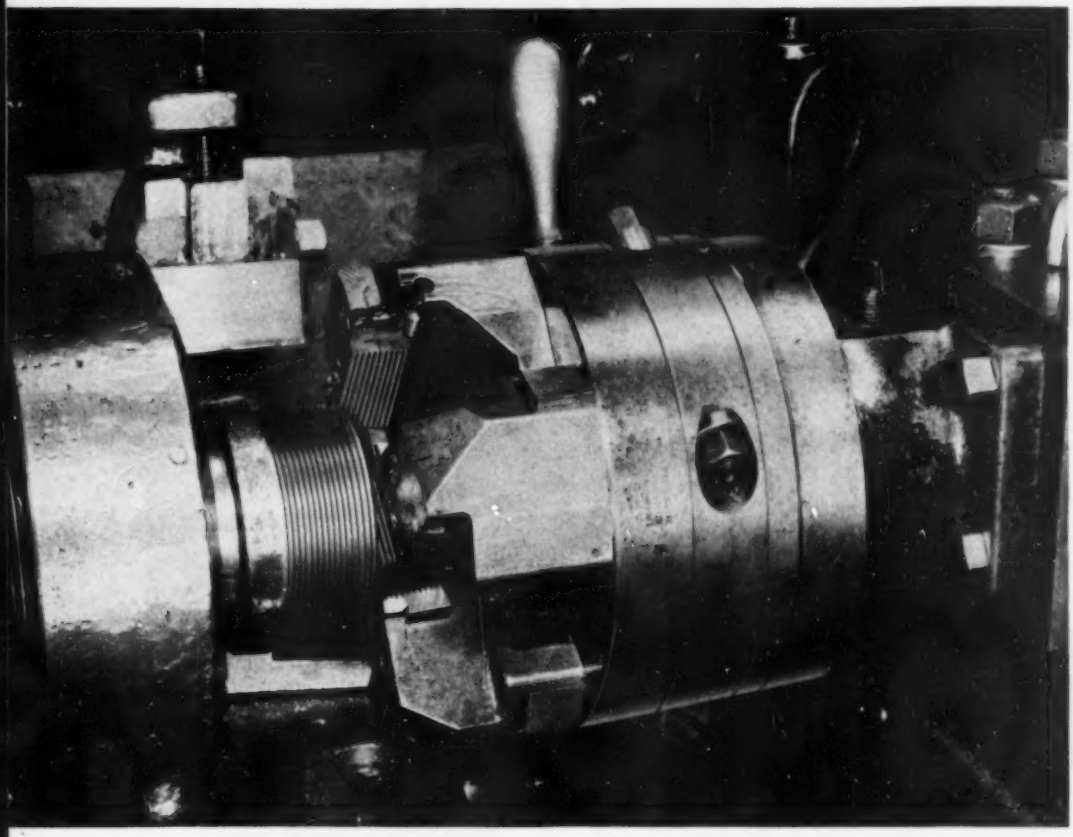
No. 38 — Table: 64" x 14"

LANDMATIC DIE HEAD

Precision Taper...

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

PRODUCES THREAD WITH



The 2" LANDMATIC Die Head with Taper Attachment illustrated is designed for cutting tapered threads where precision and thread finish are of prime importance.

The mechanically-controlled operation of the taper attachment causes the chasers to expand on diameter as the work enters the die head. Thus, cutting strains normally encountered in producing tapered threads are minimized. This results in finer thread finish, greatly improved accuracy, and materially longer chaser life.

The value of the taper attachment is particularly apparent when cutting threads with high taper or of lengths greater than those ordinarily used for standard pipe threads.

Write for Bulletin F-90.

LANDIS

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

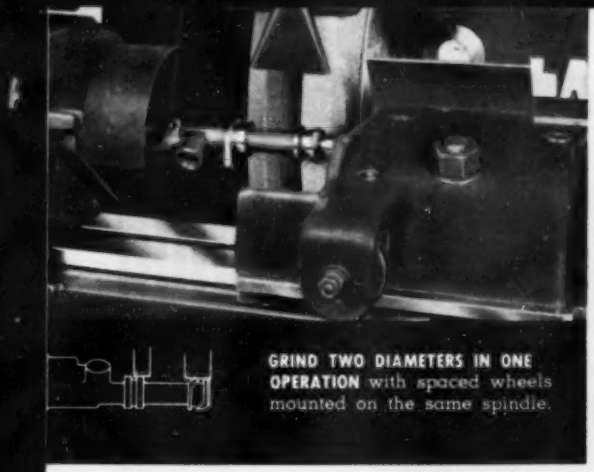
6 Ways to Cut Grinding Costs and Speed Production with Modern LANDIS CH Plain Grinders

For full specifications write for new catalog B51

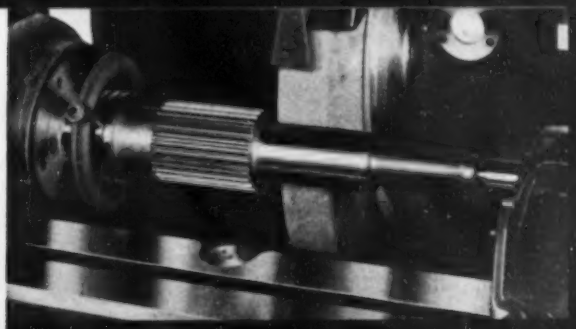
All of the latest advances in modern precision grinder design are included in this 6" x 30" Type CH Plain Grinder. Modern Landis grinders of this type provide answers to grinding problems of cost reduction and increased production. Send us prints of your work pieces for production estimates and tooling suggestions.

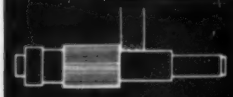
LANDIS

precision grinders



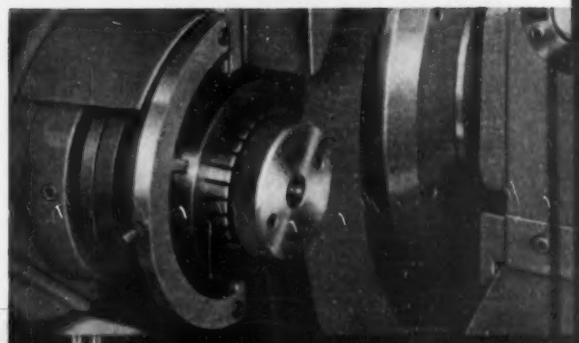
GRIND TWO DIAMETERS IN ONE OPERATION with spaced wheels mounted on the same spindle.



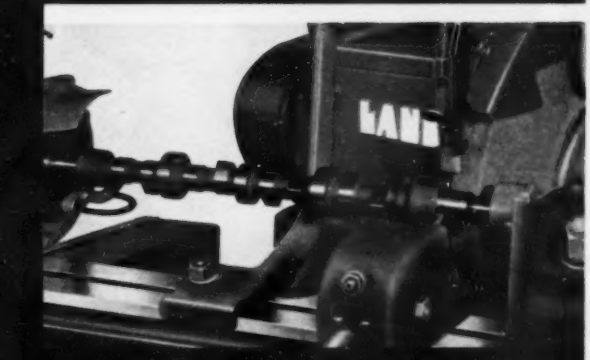


GRIND UP TO A SHOULDER with dependable and accurate reversal.

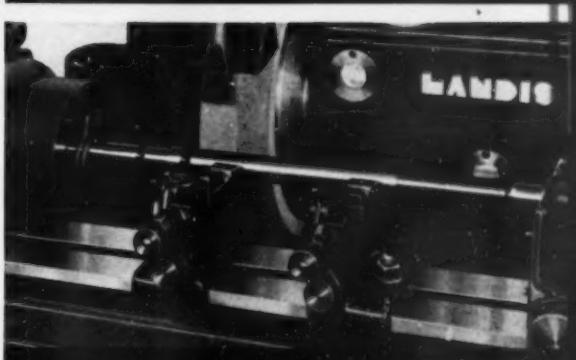
GRIND UNDER A PROJECTION with wheelbase set at 30° angle and special footstock center.

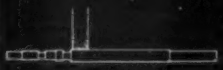


GRIND A PROFILE with profile dressed wheel, infeed grinding and expanding work holder.



GRIND DIAMETER AND ADJOINING FACE IN ONE OPERATION with wheelbase at 30° angle and work locator.





TRAVERSE GRIND WITH AUTOMATIC WHEEL FEED feeds at each or either reversal point.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Machining

tolerances held to

Here's how one manufacturer put heavy machining on a production basis—at a saving of nearly 75%!

Harnischfeger Corp., Milwaukee, used to machine heavy, bulky weldments on several different machines, each requiring a separate setup. Each increasing lost-time — adding labor costs.

Now—in one setup—through the use of this big, new Giddings

GIDDINGS & LEWIS

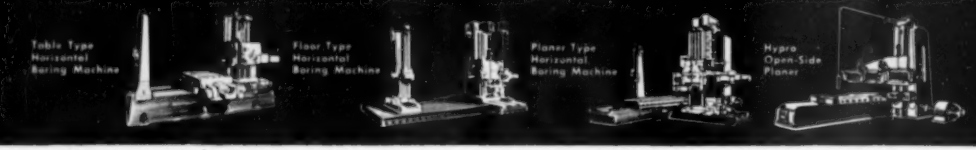


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hydro Open-Side Planer

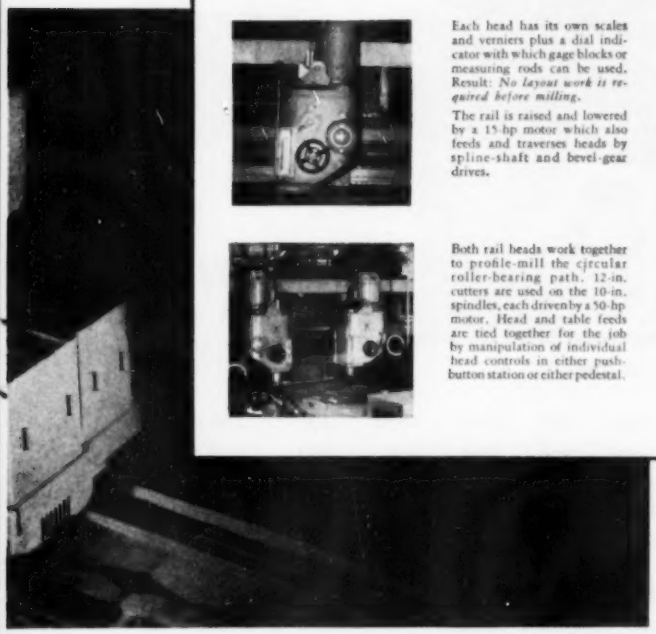
costs cut 75%

.002" on huge weldments

& Lewis planer-miller — capable of performing several operations in a single setup — all of this has changed. Today, Harnischfeger machines, on a strictly production basis, weldments as large as 12' x 9' x 24' — to tolerances within a .002". Overall machining costs reduced approximately 75%.

This is another example of the G&L 5-Point Job Analysis in action. Based on a comprehensive survey of Harnischfeger shop time and work requirements, the new G&L planer-miller checked on every count . . . offered immediate solution to curb ever-increasing costs.

Check the material at the right. See how it may pay you to get a G&L 5-Point Job Analysis.



Each head has its own scales and verniers plus a dial indicator with which gage blocks or measuring rods can be used. Result: *No layout work is required before milling.*

The rail is raised and lowered by a 15-hp motor which also feeds and traverses heads by spline-shaft and bevel-gear drives.

Both rail heads work together to profile-mill the circular roller-bearing path. 12-in. cutters are used on the 10-in. spindles, each driven by a 50-hp motor. Head and table feeds are tied together for the job by manipulation of individual head controls in either push-button station or either pedestal.

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

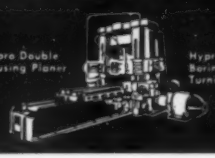
Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

MACHINE TOOL CO.

Hypro Planer Type Milling Machine



Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN

Van Keuren

MEASURING ROLLS

are just the thing for the precise measurement of

DOVETAILS
V GROOVES
AND ANGLES

Inspection set No. 17 Measuring Rolls, complete in mahogany case $212.75. Set No. 17 contains 2 rolls each of sizes:—

.050	.0625	.100	.125	.150	.1875	.200	.250	.300
.400	.500	.600	.700	.750	.800	.900	1.000	

All rolls are 1" long and are guaranteed to be within .00002" for roundness, straightness and exact size.

Complete details on this and other Precision Measuring Tools are given in the Van Keuren 1952 Catalog and Handbook No. 35.

● ***WRITE FOR YOUR COPY***

THE Van Keuren CO.,
173 WALTHAM STREET, WATERTOWN, MASS.
33rd YEAR
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

How to slash your chip-disposal costs

Link-Belt FLEXMOUNT Oscillating Conveyors built into Cross automatic transfer-type machines for automotive production.

Only FLEXMOUNT gives you these 8 big advantages

1. POSITIVE ACTION. Uniform, continuous chip flow is assured regardless of load. Natural spring action reduces horsepower requirements to a minimum.

2. LEAK-PROOF. Trough is a single piece of metal. No coolant drip between machine and drain point. No return run.

3. COMPACT. A "natural" for restricted space. Opening need be only slightly larger than trough.

4. LONG LIFE. Minimum of moving parts. No joints or bearings in contact with material. The resilient legs that provide spring action last indefinitely.

5. LOW MAINTENANCE. Operates at low speed. Only drive need be lubricated.

6. SAFE. No moving parts in conveying trough.

7. JAM-PROOF. Reduces production stoppages. Handles bolts, nuts, bars, broken tools and even rags.

8. VERSATILE. Various widths, standard lengths up to 100 ft., with one drive. Dividers can be installed to convey simultaneously two or more materials, such as brass and steel chips, without mixing.

Link-Belt FLEXMOUNT Oscillating Conveyor is simple, compact... offers real savings in carrying off and collecting ferrous and non-ferrous chips

HERE'S the latest advance in chip disposal for high-production metal-working shops. Leading auto makers and machine tool builders are rapidly standardizing on new Link-Belt FLEXMOUNT Oscillating Conveyors—as integral equipment and as collecting conveyors for carrying chips to a central disposal point.

Check the outstanding operating advantages shown at left. See for yourself how the Link-Belt FLEXMOUNT meets the modern demand for improved chip handling.

LINK-BELT

FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

12.410-60

Everyone Can Count on VEEDER-ROOT

Military reconnaissance men know the value of the "intelligence reports" faithfully rendered by these Veeder-Root Distance and Topography Counters. And other men, who have to do the close figuring in other arms of the service, they too count on Veeder-Root Counters in more ways than you could shake a "slip-stick" at.

Now if we can help *you* to help these men, by figuring out some new and unusual application of Veeder-Root *Count*rol in defense production, then you can count us at your service, *beginning right now.*

VEEDER-ROOT INCORPORATED

"The Name That Counts"

HARTFORD 2, CONN. • GREENVILLE, S. C.

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"Counts Everything on Earth"

for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...

Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10375

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YOU CAN BE SURE... IF IT'S Westinghouse

HEAT-TREATING FURNACES

Westinghouse Electric Corporation,
Industrial Heating Department
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Please send me free booklet, "Westinghouse Furnaces for the Toolroom, Laboratory or Production Line"

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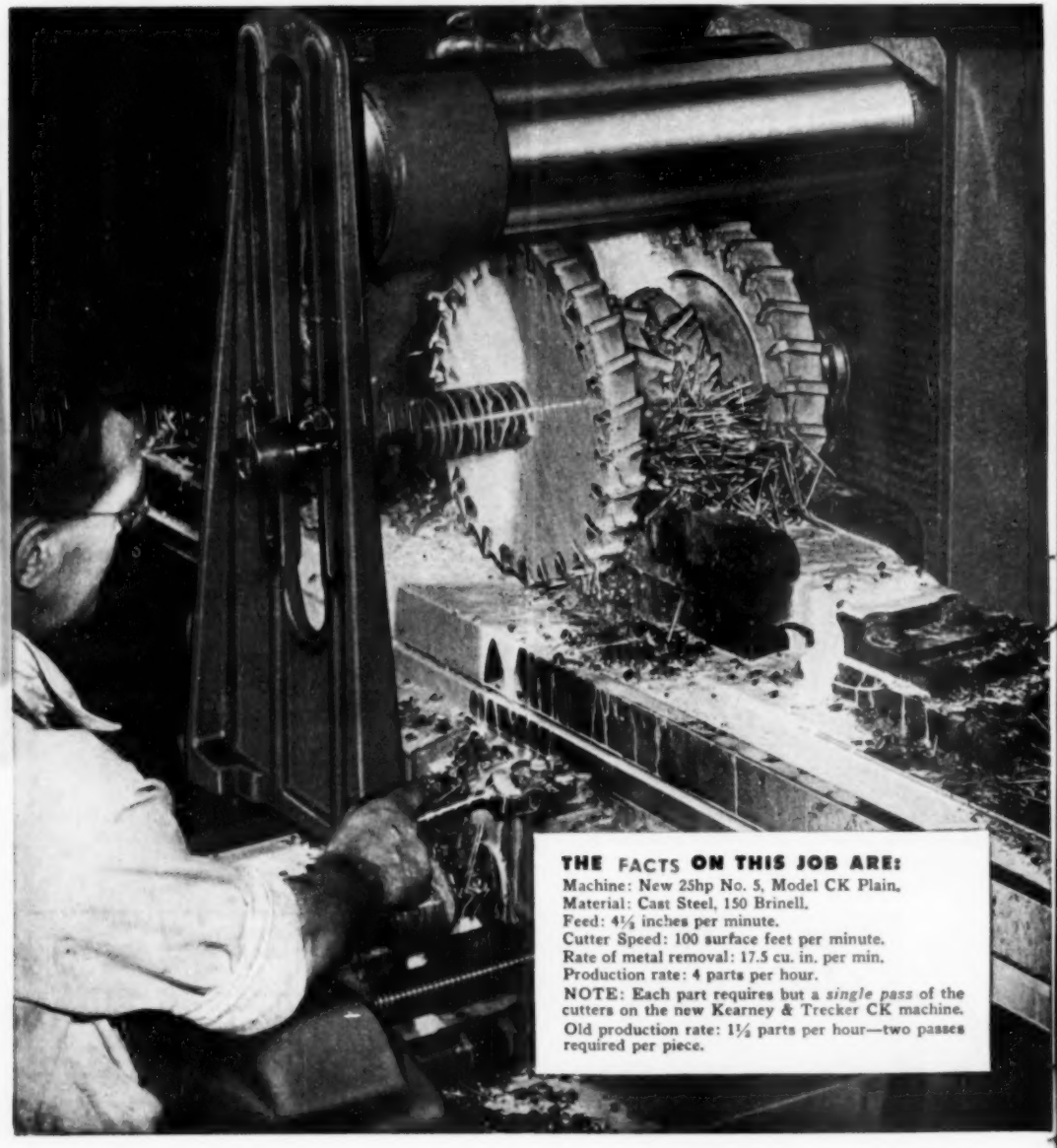
facts tell the story { NEW KEARNEY & TRECKER CK USER BIG



THE FACTS ON THIS JOB ARE:

Machine: New 25hp No. 5, Model CK Plain.
Material: Cast Steel, 150 Brinell.
Feed: 4½ inches per minute.
Cutter Speed: 100 surface feet per minute.
Rate of metal removal: 17.5 cu. in. per min.
Production rate: 4 parts per hour.

NOTE: Each part requires but a *single pass* of the cutters on the new Kearney & Trecker CK machine.

Old production rate: 1½ parts per hour—two passes required per piece.

MILLING MACHINE PAYS PRODUCTION DIVIDEND

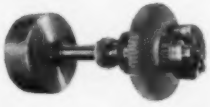
NEW 25HP CK PLAIN MACHINE OUT PRODUCES PREVIOUS MACHINE NEARLY 4 TO 1!

CK MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

CK's positive, metered pressure and automatic lubrication assured cool, wear-free operation in spite of heavy cutting load.

No. 60 heavy-duty drive flange around spindle nose permitted use of an extra-rigid heavy-duty arbor on this multiple cutter setup.

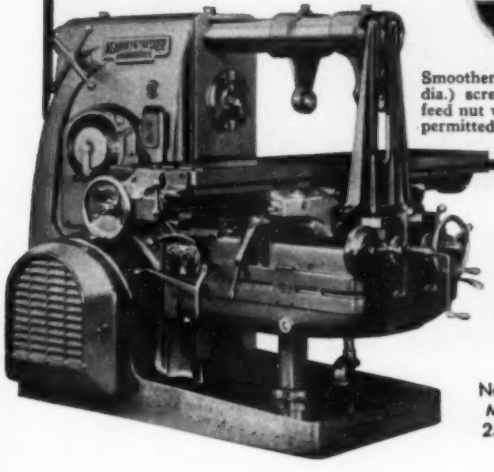


CK's 3-bearing spindle and flywheel assure Maximum Cutter Efficiency. On this job it meant fast metal removal and smooth finish in a single pass.

The new Kearney & Trecker CK milling machine doing this job has 24 different spindle speeds (13 to 1300 rpm.) Its 32 different table feeds range from ¾" to 90" per minute. Thus operator was able to *pick exact speed and feed* to get fullest advantage from high horsepower and modern cutting tools. This meant Greater Productivity on this job.

Smoother Feed of CK's large (2" dia.) screw and extra-long table feed nut with backlash eliminator permitted heavy cut.

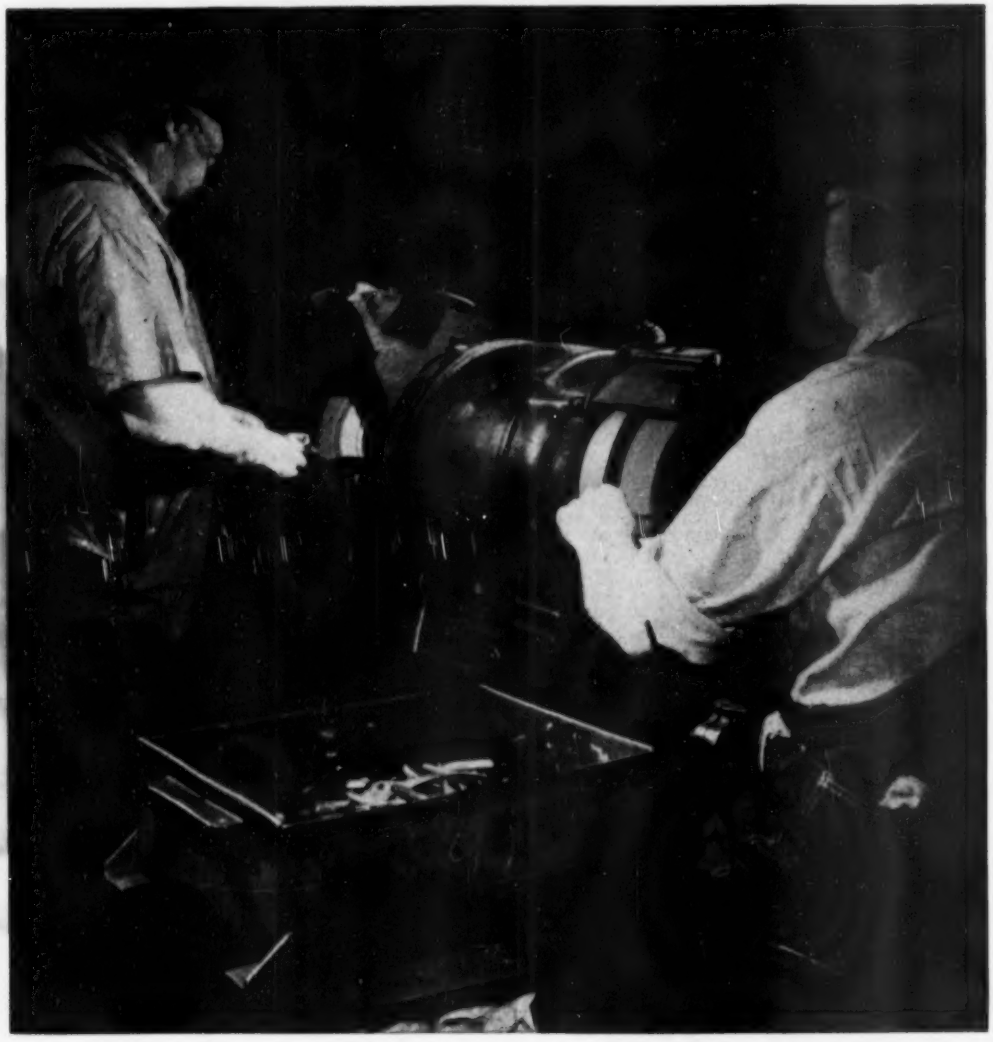
New CK machines have Greater Horsepower. On this job, 25hp enabled operator to get maximum production from his cutters.



New No. 4 Model CK 25hp Plain

Investigate the new CK line of milling machines. You'll find every feature is test and job-proven to give you cost-cutting results . . . greater machine capacity, productivity and better finished products. Contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

TO CUT COSTS ...ever think of



Only CARBO TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York.

switching to an abrasive BELT?

Grinding and polishing techniques have undergone major improvements in the past few years. One of many revolutionary developments is the "61" contact wheel, used with a coated belt on many operations previously performed with a bonded or a set-up wheel. In every case, the change has been made for just one reason —to yield a better result at a lower cost.

This is the kind of change that spells progress to every metalworking man who is battling against higher and higher costs. And this is the reason why you should welcome the CARBORUNDUM man or distributor salesman when he calls on you. There is nobody quite like him, for he's not in the position of having to back just one type of product, or two. He alone has the ability to help you specify the one RIGHT combination of abrasive product and abrasive method for every operation in your shop.

His counsel is experienced, practical, and above all completely free from bias—for he represents the only complete line of abrasives, from CARBORUNDUM, the world's best known brand name in abrasives. We suggest that you call him in today—it's to your profit!

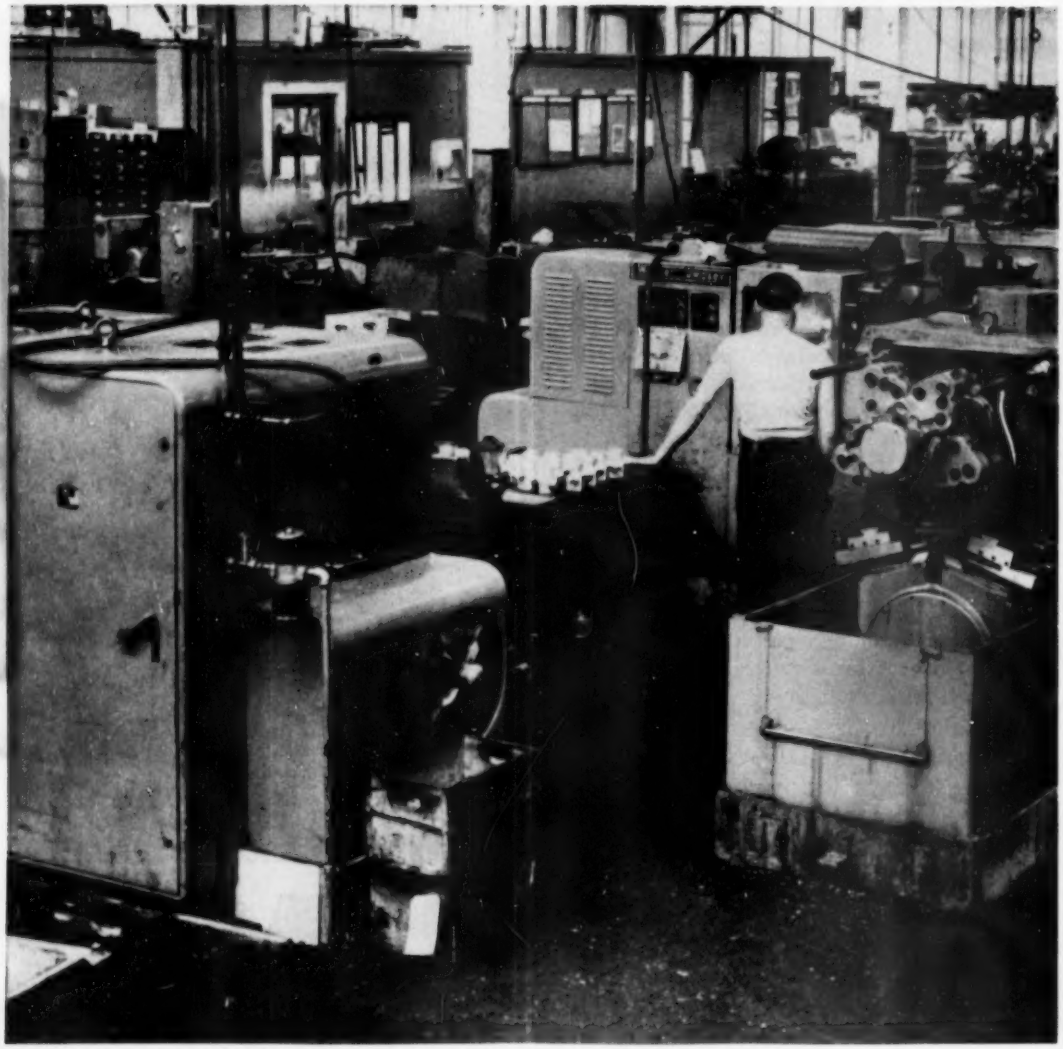
Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

How would you like to see



Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines in use at Walter Kidde & Company, Inc., a leading manufacturer of fire extinguishing apparatus, textile machinery, aircraft and marine equipment.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER

your costs going down?

(FOR A CHANGE)

• With spiraling costs the headaches they are today, it's especially encouraging to see examples of costs going down. And that's exactly what happened at Walter Kidde & Company, Inc. of Belleville, N. J. This manufacturer put the skids under constantly rising costs by installing six new Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines.

These new machines now handle turning and chucking operations on nine different parts—all formerly done with hand-operated machines—at less than ⅓ of the previous cost.

But that's not all! The 1-AC's helped solve a pressing manpower problem, because one operator can now handle two or more machines.

Result? The Kidde Company now has eight new machines on order with Warner & Swasey—which will give them a total of fourteen 1-AC's!

WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

TOPS IN *Tap Performance*

Specify NATIONAL *Reamers*

NATIONAL Reamers mean better performance, smoother finish, longer life.

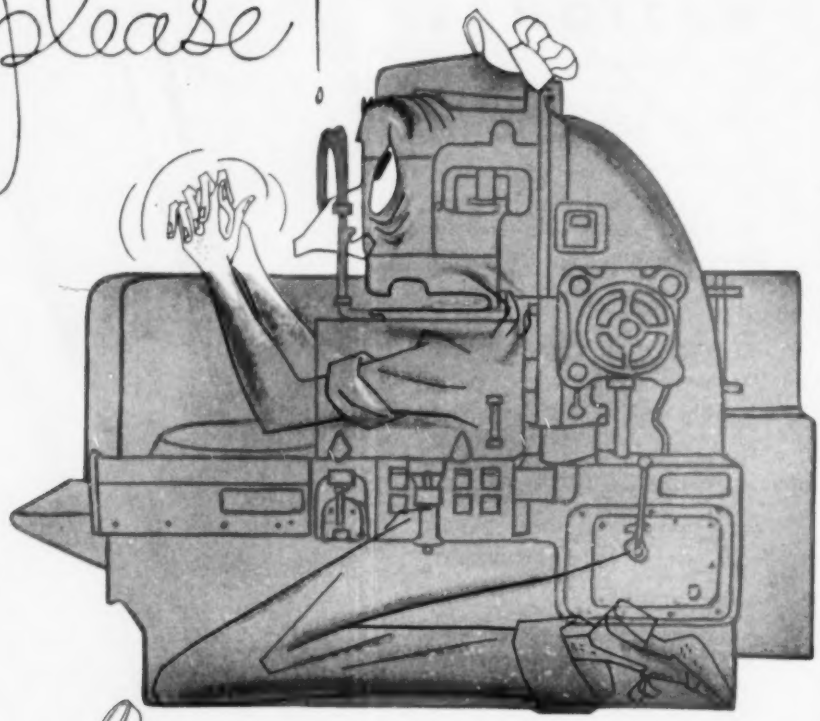
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A.
Distributors in principal cities. Factory Branches: New York, Chicago, Cleveland, Detroit, San Francisco.

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

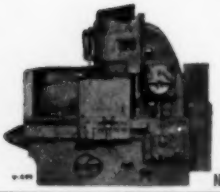
. . . for all your staple industrial needs, including NATIONAL twist drills, reamers, counterbores, milling cutters, end mills, hobs, and special tools.

National

please!



Blanchard builds good surface grinders. They are precision machines and also rugged—built to last! Properly maintained, they will grind parts quickly and accurately for many years. Now, when the urgent demands of defense industries are lengthening delivery dates on new Blanchard grinders, it is vitally important that you take good care of the Blanchards you now have. When operating on two shifts, machines should be cleaned, oiled and greased twice as often — on three shifts, three times as often! Complete maintenance instructions are shipped with every new Blanchard grinder. If you would like an additional copy, just drop us a card giving the serial numbers of your grinders. Taking good care of your Blanchards will enable them to take good care of you!



NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

"CATERPILLAR"

+

"American"

A coalition of outstanding "name" products dedicated to the interests of industry.

Here is a "Caterpillar" Diesel DW20 Tractor with W20 Wagon loading heavy clay for the Garza-Little Elm Dam near Lewisville, Texas.

The astonishing ease of operation of these units due to their ultra-modern design makes the "load" lighter and the cost lower.

For the very same reason "Caterpillar" uses many "American" Radials. Because of their ultra-modern design they make the drilling, boring and tapping "load" lighter in "Caterpillar" plants and keep the cost of production at a minimum.

Extra power, centralized control, boring mill type spindle and extra fast tapping are outstanding virtues of "American" Hole Wizard Radials which swell the operator's pay envelope and help keep production on a profitable plane.

For more work, better work and lower cost work, get the facts about "AMERICAN".

Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

Capillarity test proves ALUNDUM* Abrasive *makes polishing wheels last longer and perform better*

Capillarity, the ability to absorb liquid, is one property of abrasives which largely determines a polishing wheel's strength and resistance to breakdown. When abrasive grain has high capillarity it is held more firmly by the glue on the wheel head — sticks on the wheel until *all* its work is done.

Norton ALUNDUM abrasive is specially treated to raise its capillarity — and to retain this valuable quality — assuring longer lasting, more efficient polishing wheels.

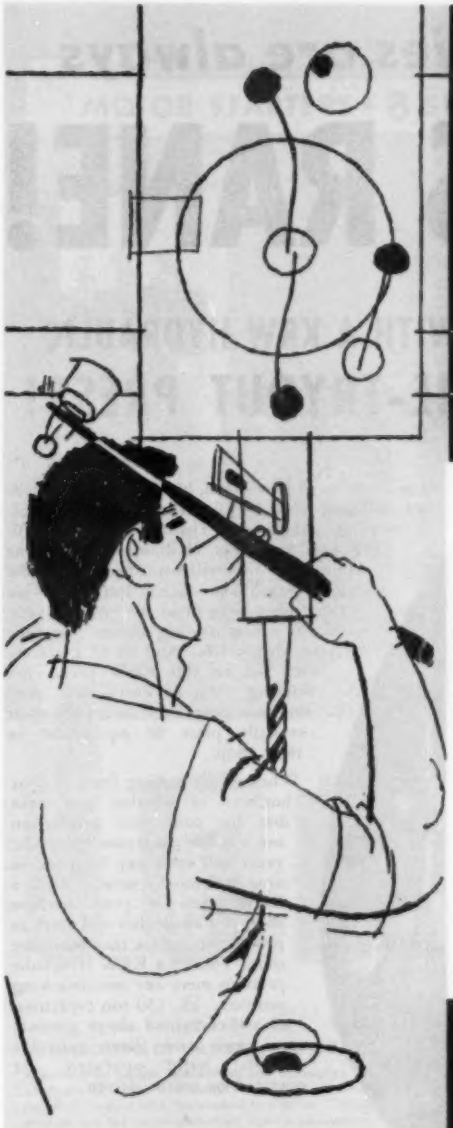
Offering many other advantages for fast, clean polishing, ALUNDUM abrasive grain is available in sizes and with surface treatments for best results on every polishing job. Write for Booklet No. 1340, "*Setting Up Polishing Wheels And Belts*," containing many helpful tips. Norton Company, Worcester 6, Mass. Distributors in all principal cities.

NORTON
ABRASIVES
Making better products to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

LOW CAPILLARITY is shown by the way this abrasive grain sheds water. It will repel glue in the same degree, resulting in insecure adhesion of abrasive to wheel head — and short wheel life.

HIGH CAPILLARITY of Norton ALUNDUM abrasive grain soaks up every drop of water. It will soak up glue in the same way, assuring a stronger, longer lasting, faster cutting polishing wheel.

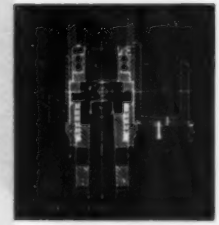


ARE YOU *HAMMERING* YOUR DRILL TOOLS INTO THE SCRAP PILE?

Tools on the scrap pile mean profits out the window. Then why let drills be pounded into scrap by the old-fashioned hammer-and-drift method of removal?

Fosdick Drills, equipped with Tool Ejectors, eliminate the need for hammers and drifts. The operator simply engages the Tool Ejector, grasps the tool with one hand and withdraws the spindle with the other. There's virtually no possibility of tool points striking the table. Operators save the time formerly spent groping for unnecessary tools. Drill, tap and reamer shanks stay smooth, keep your tools running right on center.

You don't need attachments—it's all done without special chucks, using standard taper shank tools.



THE TOOL EJECTOR is another "first" from Fosdick, design leader in drilling machinery, and *first* to apply hydraulics to Radial Drill controls. Remember, only Fosdick can equip its drills with the Tool Ejector.

CALL YOUR DISTRIBUTOR FOR MORE INFORMATION OR WRITE CINCINNATI DIRECT.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS
AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

THE FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

FOSDICK

Make sure your dies are always

RIGHT AS RANE!

WITH A KRW HYDRAULIC DIE-TRYOUT PRESS!

Rane Tool Co. of Jamestown, N. Y., makes hundreds of different dies for America's leading metal-working companies. Thanks to their KRW 125 ton, 3-cylinder Hydraulic press, Rane knows their dies will work perfectly in the customer's plant. Some Rane dies are small enough to fit in the palm of your hand; others are big babies that take ten men to lift. And all of them are tried out on this KRW press. It's working 95% of every day. And the Rane people tell us it's the most versatile piece of equipment in their shop.

Whether die-making itself is your business, or whether you make dies for your own production use, a KRW die-tryout Hydraulic press will soon pay for itself in time and money saved. With a KRW press in your machine shop you *know* dies will work in production before they leave the shop. There's a KRW Hydraulic press to meet any metalworking problem. 25 - 150 ton capacities, all self-contained above ground; one, two and three cylinder models; hand operated, air operated or motor driven.

•

Ask your machinery dealer to quote you or write, wire or phone Dept. 11 for full facts, prices and delivery dates.

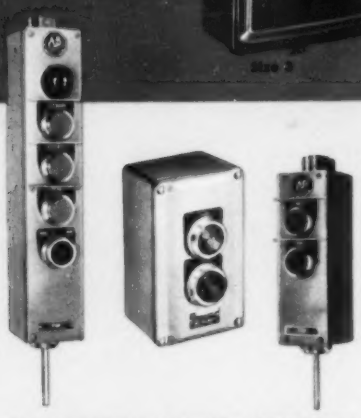
SINCE 1916 KRW A MARK OF DEPENDABILITY

K·R·WILSON

Designers and builders of hydraulic presses to meet any metal working problem

215 MAIN STREET • BUFFALO 2, N. Y.

MOTOR STARTERS • 8 SIZES • ALL SOLENOID OPERATED



COMPLETE LINE OF OILTIGHT ACCESSORIES

Allen-Bradley oiltight push buttons and accessories are available for single and multiple controls in all forms, including pendent types for machine tool drives. Oiltight gaskets seal the switch mechanism against oil seepage around push buttons and covers.

There are pilot lights, selector switches, stop and start push buttons, limit switches, and many other varieties of controls in the standard Allen-Bradley line to meet every machine tool requirement.

Automatic Starters That Satisfy All Machine Tool Applications

Machine tool speeds are being steadily increased—machining operations are demanding greater and greater precision in motor control performance. These simple facts explain why Allen-Bradley solenoid motor controls . . . with only one moving part . . . are so popular with machine tool builders. In the complete line from Size 0 to Size 7, the same trouble free solenoid principle is used. There are no clapper switches . . . hence, no change in performance . . . no loss of compactness . . . no drop in dependability.

This basic design simplicity accounts for the supreme popularity of Allen-Bradley controls. The A-B trademark is a sales asset on any machine. May we send you our Handy Catalog?

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

2-52-R

A-B Quality

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

AVAILABLE IN *Three* HANDY FORMS

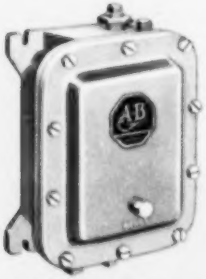
FORM 1 with Start and Stop push buttons for machines where the starter can be located conveniently near the operator.

FORM 2 with plain cover for machines where starter must be operated by remote push buttons or limit switches.

FORM 3 with Hand-Off-Auto 3-way selector switch for air conditioners, pumps, and other automatic machinery.

ALLEN-BRADLEY SOLENOID STARTERS

in Enclosures for Every Type of Industrial Service



Allen-Bradley starters are available in various standard NEMA type enclosures.

Machinery designers who realize the importance of selecting the right enclosure for each application are specifying Form 1 enclosures with Start and Stop push buttons for many machines, thus reducing the installation cost of control wiring. For machines requiring manual as well as automatic control, they use the handy Form 3 enclosure. All starters are available in a variety of NEMA type enclosures to meet any service requirement. For full information, let us send you the Allen-Bradley Handy Catalog.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

2-52-MR

.0001" ACCURACY

THE DRESSER WITH A MICROMETER FEED

*J & S "Fluidmotion"** Radius and Angle Dressers

Dress* Two Angles *Tangent* to a radius *in ONE CONTINUOUS MOTION

ELIMINATE GAGE BLOCK—MASTER GAGE SETTING—JO BLOCK—PARALLEL BAR—SURFACE PLATE—HEIGHT GAGE—DIAL INDICATOR—CHATTER MARKS OR TOOL MARKS AND COSTLY MAJOR REPAIRS.

WITH J & S "Fluidmotion," it is not necessary to preset the diamond, all that is needed is a micrometer and a simple hex wrench.

SETTING UP is easily done right on the surface or cylindrical grinders.

TOOL GRINDERS are at a premium—by employing J & S "Fluidmotion" you can very easily develop top notch tool grinders.

WE STATE and can back up—of the last 2000 "Fluidmotion" Radii & Angle Wheel Dressers sold in the last 10 years—LESS THAN 1% HAVE BEEN RETURNED FOR SERVICING and NONE DUE TO WEAR. The average cost for servicing is approximately $4.00 per year, over a 5-year period.

BECAUSE "Fluidmotion" is made from the finest HIGH-CARBON, HIGH-CHROME, hardened, ground and lapped alloy steels, highly resistant to abrasive action.

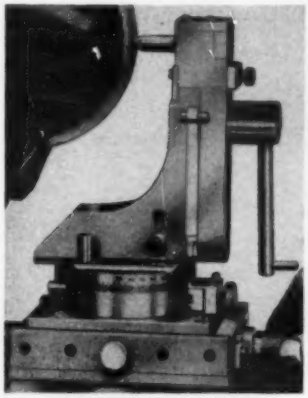
GIBS & V-WAYS are **positioning surfaces only** for dressing angles **which eliminates** the conventional method of movements on dovetails which also is always exposed to grit and coolants.

RADII precise **sharp** contours, concave or convex, at a full 180°, are obtained consistently with (GUARANTEED) 0.0001" accuracy.

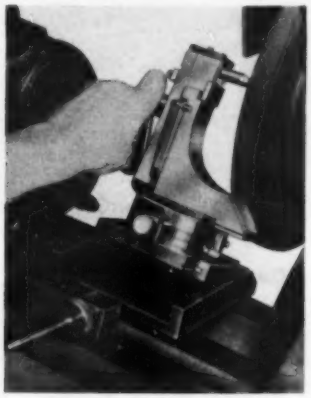
CONCAVE RANGE—1/32" to 3 inches
CONVEX RANGE—zero to 3 inches

Special dressing equipment can be furnished to dress wheels up to 36" in diameter. Dresser swivels on Stainless Steel Ball Bearings which are **completely protected from dust.**

ANGLES Hold intersecting angles 12 to 15 seconds, THIS is actuated by upright and handle. Setting up two angles requires 10 seconds. Setting two angles and radius requires less than 3 minutes.



ON SURFACE GRINDERS
MODEL "C" SHOWN



UP TO 36" DIA. WHEELS
ON CYLINDRICAL GRINDERS

MODEL "H-24" up to 24" wheel
MODEL "H-36" up to 36" wheel

HEIGHT OF DIAMOND POINT FROM TABLE IS AS FOLLOWS:
J & S "FLUIDMOTION" SERIES

Model "C" up to 14" dia. wheel—with micrometer feed is 8⅝" above table.
Model "E" up to 14" dia. wheel—without micrometer feed is 7⅛" above table.
Model "FG" up to 7" dia. wheel—with micrometer feed is 6¼" above table.
Model "F" up to 6" dia. wheel—without micrometer feed is 5" above table.
Model "HC" up to 36" dia. wheel—with micrometer feed is 15¼" above table.
Model "H" up to 36" dia. wheel—without micrometer feed is 14" above table.

For shops having less frequent wheel dressing requirements our less expensive "Form Master" Radius & Angle Wheel Dresser is available. Wheel capacity, up to 10" and diamond is 7¼" above table.

***DELIVERY* for month of April on above Models:**
3 WEEKS AFTER RECEIPT OF ORDER. F.O.B. EAST ORANGE, N. J.

OTHER "Machine Shop TIME SAVERS" by J & S:
J & S "All-Purpose" Jaw Clamps. Special Purpose Form Tools of Solid Carbide—High Speed Steel.

For Details, write to:

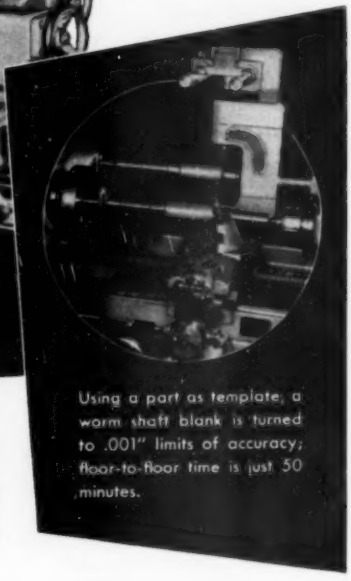
J&S TOOL CO., INC.
819 Main Street, East Orange, N. J.
Representatives in Principal Cities

***Reg. U.S. Pat. Off.**

LODGE & SHIPLEY *COPYMATIC*

Saves 40% to 70% time

on 28 different shaft jobs



Using a part as template, a worm shaft blank is turned to .001" limits of accuracy; floor-to-floor time is just 50 minutes.

. . . at Bay City Shovels Inc., Bay City, Michigan

In analyzing user reports on the Lodge & Shipley COPYMATIC the same two words pop up again and again: "time saved!" This particular user, a well-known power shovel manufacturer, found the COPYMATIC saved up to 70% in time on a wide variety of jobs.

Other expressions of COPYMATIC superiority are mentioned regularly: "wonderful for tapers and contours . . . very easy to operate . . . very accurate," as stated by Bay City Shovels Inc.

The "well done" reports of large and small shops using the COPYMATIC may point up to you similar profit possibilities . . . whatever your product or size of operations. Model "X" engine lathe versatility with the speed and convenience of hydraulically-controlled duplication is a profitable combination for almost any user.

Would you like further information, an explanation of how much the COPYMATIC can save you?
Write today for Bulletin No. 675 and case histories.

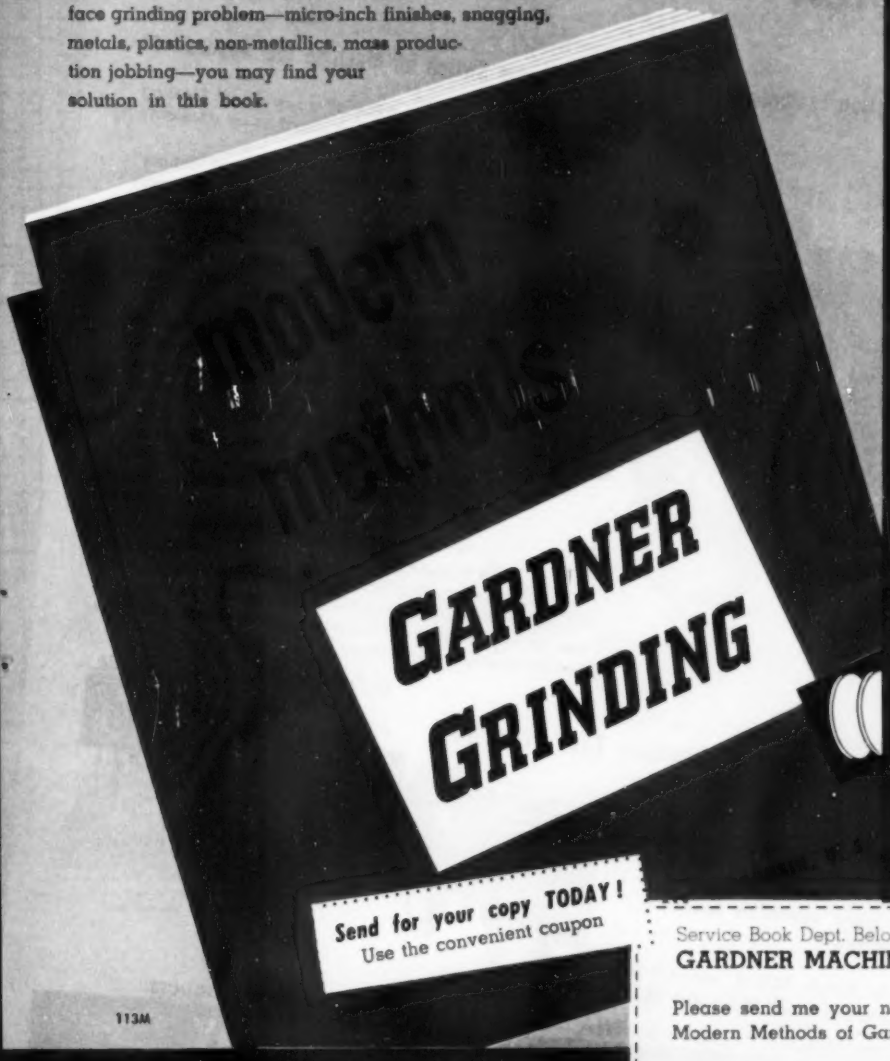
THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

If You Do Flat Surface Grinding...

Compare your operations with the 25 case studies described in this new book

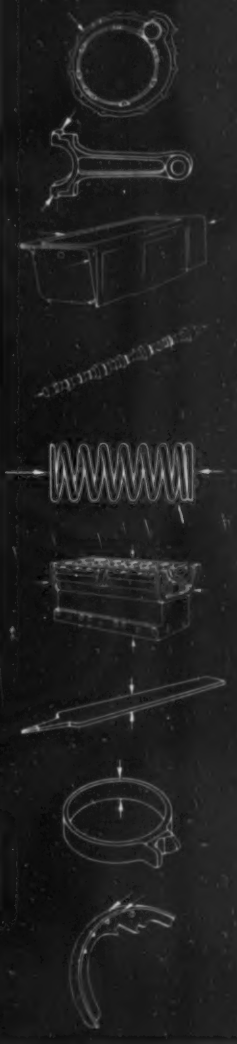
This book illustrates 25 case studies of disc grinding applications with Gardner Precision Disc Grinders. It includes production data, specifications and other important data. If you have a flat surface grinding problem—micro-inch finishes, snagging, metals, plastics, non-metallics, mass production jobbing—you may find your solution in this book.

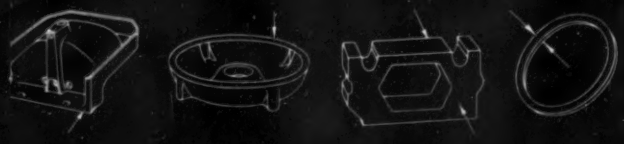


Send for your copy TODAY!
Use the convenient coupon

113M

Typical Work Pieces ground on Gardner Grinders





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Modern Methods of Gardner Grinding

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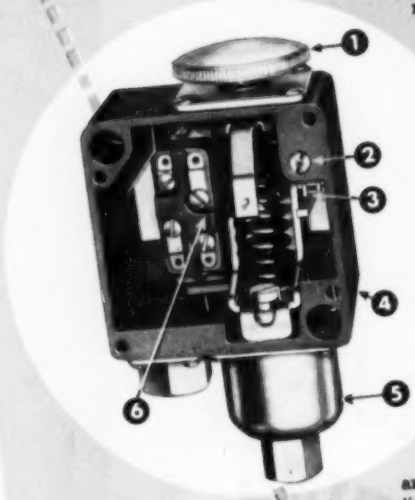
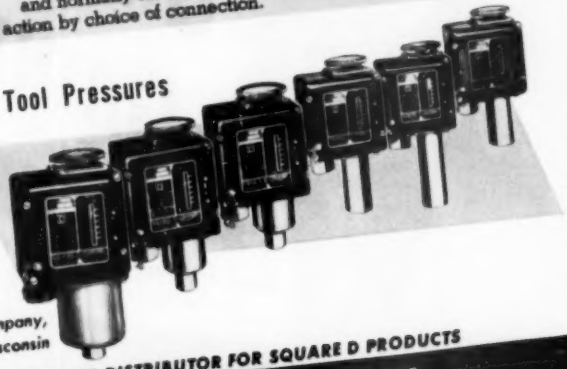
THIS PRESSURE SWITCH IS *Designed* FOR MACHINE TOOL SERVICE

These Construction Features Make it a Better Pressure Switch for Machine Tool Applications



1. **RANGE:** Externally adjustable by screw driver (sealing cap, form V, available when specified) or by accessory metal knob. Scale indication.
2. **DIFFERENTIAL** between "cut-in" and "cut-out" pressures can easily be changed by a set-screw adjustment accessible with cover removed.
3. **INDICATOR:** Supplied on type ACW1 welder switch to permit visual observation of switch action when establishing electrode setting.
4. **ENCLOSURE:** Gasketed, die-cast construction is drip-tight and oil-resistant. Mounting holes are sealed by cover gasket. Chained cover has self-retaining screws. Conduit hub is detachable.
5. **MECHANISM:** Bellows are heavy-wall, seamless. Hardened parts and short travel characteristic of operating mechanism insure unusually long mechanical life. Piston actuators available where surge conditions prevail.
6. **CONTACTS:** Heavy-duty, snap-action switch mechanism of self-contained type is readily removed for inspection or replacement. Separated normally-open and normally-closed circuits permit either direct or reverse action by choice of connection.

Covers Entire Range of Machine Tool Pressures



Eleven variations of the basic pressure switch are available, any two or three of which will serve most machine builders' requirements.

Write for Bulletin 9012-A, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

You can use other lathes.... employ other types of metal-working machines....but on no other tool can you get so much production with such fine precision as on a Rivett!

Rivett 918 "Steelway" Cabinet Turret Lathe

Qualities of leadership

Any one of 90 to 3750 R.P.M. cutting speeds instantly selected through convenient control and dial indication.

Double-bevel steel ways, hardened and ground, provide maximum bearing and positive centering action.

Optional stationary or draw-in collet with greater capacity and accuracy.

Convenient lever chuck closer may also control spindle drive and brake with opening and closing of collet.

Produces small duplicate parts speedily in unlimited quantities with precision known only to the toolroom. The accuracy for which Rivett has long been a symbol is combined with time-saving features that reduce set-up and cutting operations to a fraction of that normally required.

Get proof of what the 918 will accomplish. Send for Bulletin 918-ST.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR-3, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

You'll get the right answers to your resistance welding die design problems from MALLORY

Example of Mallory ingenuity and know-how is this special die for simultaneously projection welding 3 separate fin-like components to a conical sleeve.

HOW TO GET HIGH WELDING PRODUCTION AT LOW COST

When you turn to Mallory for your resistance welding needs, you take advantage of experience gained in more than 20 years of pioneering research and applied engineering in resistance welding alloys.

That's why you can count on Mallory products and services for outstanding performance at low cost. Call on Mallory for resistance welding . . .

Electrodes	Holders
Dies	Rods & Bars
Castings	Forgings

You get what you want—high production at low cost—with Mallory-designed resistance welding dies. They're right for you because you get . . .

- **Fast delivery**
- **Low initial cost**
- **Low operating cost**
- **Maximum shop production**

With Mallory-designed and built resistance welding dies you get the benefit of . . .

More than 20 years of die-making and metallurgical experience.

Designs that include replaceable inserts . . . maximum water cooling . . . alloys developed to give maximum life.

Call or write Mallory whenever you have a die design problem. You'll get the right answer.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

P. R. MALLORY & CO. Inc.

MALLORY

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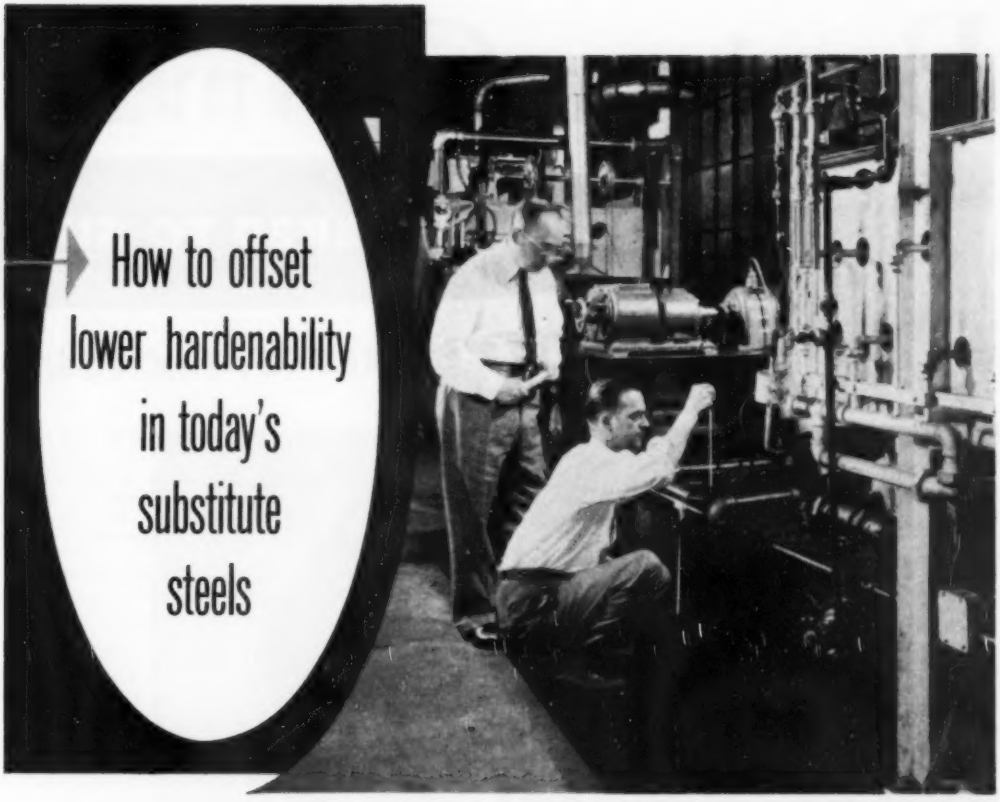
For information on Titanium Developments contact Mallory-Sharon Titanium Corp., Niles, Ohio.



Switch to GULF SUPER-QUENCH, *the oil with greater quenching power*

Is the current alloy shortage creating a heat-treating problem for you? Must you accept alloy steels with less nickel, molybdenum, and chromium than you originally specified? Then you'll be interested in the performance of Gulf Super-Quench. Because of its greater quenching power, this outstanding quenching oil helps offset the lower hardenability of today's substitute steels.

Gulf Super-Quench passes through the vapor stage far more quickly than conventional quenching oils. This means that the cooling rate is extremely fast at the outset, an important factor in the depth and uniformity of hardening. In the succeeding stages Gulf Super-Quench has a slow cooling rate, like that of conventional quenching oils, and therefore has the same minimum tendency toward distortion and cracking.

Greater quenching power of Gulf Super-Quench adds up to greater depth of hardening and more uniform hardness! One of the most practical advantages of Gulf Super-Quench is greater uniformity of results on steels of variable hardenability.

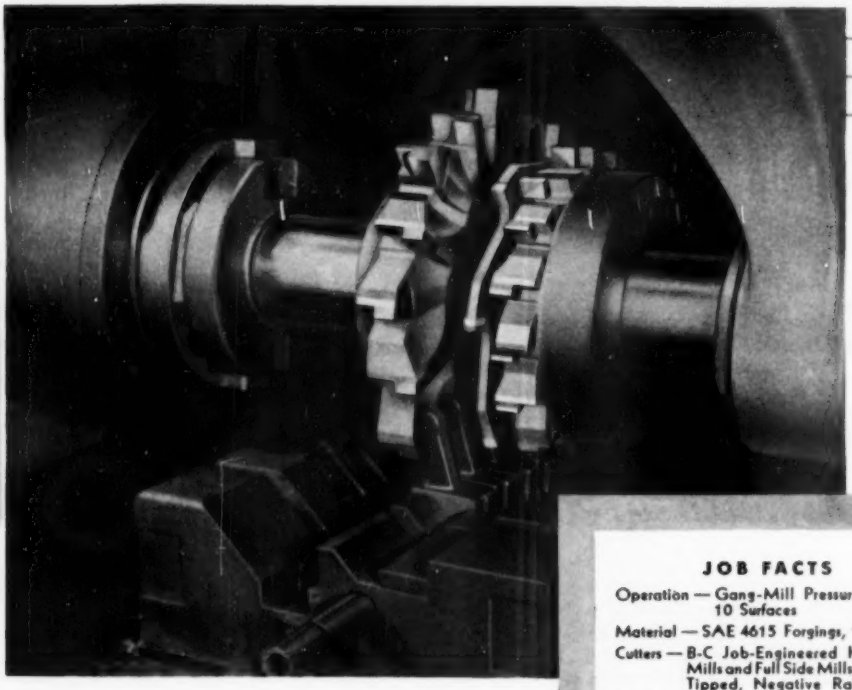
For further information on Gulf Super-Quench, call in a Gulf Sales Engineer today. Write, wire, or phone your nearest Gulf office.

GULF SERVES INDUSTRY

Barber-Colman

JOB-ENGINEERED TO SUIT

COMBINE CUTS • SPEED OPERATIONS ••



JOB FACTS

Operation — Gang-Mill Pressure Levers, 10 Surfaces

Material — SAE 4615 Forgings, 180 Br.

Cutters — B-C Job-Engineered Half-Side Mills and Full Side Mills, Carbide-Tipped, Negative Rake Teeth

Feed — 11"/minute, Climb Cut

Speed — 360 SFM. on Largest Diameter

Fl-to-Fl — 100 per Hour

Tool Life — 1900 Pieces Per Gang Sharpening

HOBS • MILLING CUTTERS • REAMERS • HOBBING MACHINES • SHARPENING MACHINES

MILLING CUTTERS

YOUR SPECIAL PROBLEMS

• • PROLONG TOOL LIFE • DUPLICATE ACCURACY

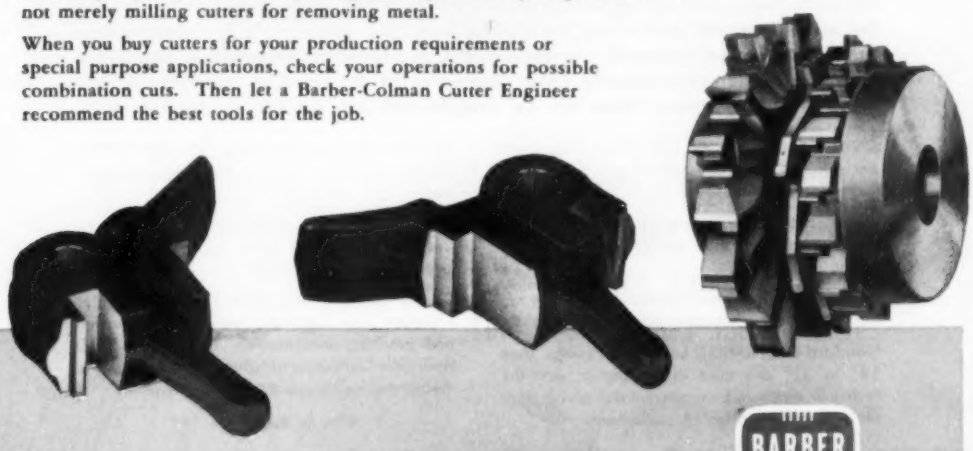
These Carbide-Tipped Gang Cutters
Mill Ten Surfaces At One Time!
Produce 1900 Pieces Per Sharpening!

A good way to beat today's high cost of production is to combine several operations into one. This job is a good example of how Barber-Colman Milling Cutters, engineered for the specific problem, boost output, save production time and produce maximum number of pieces per cutter life.

Ten different dimensions are machined on tough steel forgings, 4 pieces per load, 100 per hour. Rigid workpiece and cutter mounting permit a fast feed of 11″ per minute and 187 cutter r.p.m. — with no sacrifice in tool life. An average of 1900 parts are machined per gang sharpening.

On all orders for milling cutters, Barber-Colman Engineers look first at the job to be done. They then apply the form, number of teeth, tooth shape, tolerances, steel specifications and heat-treatment in the best combination for doing that job. Because of this analysis you get tools designed specifically to solve your problems — not merely milling cutters for removing metal.

When you buy cutters for your production requirements or special purpose applications, check your operations for possible combination cuts. Then let a Barber-Colman Cutter Engineer recommend the best tools for the job.



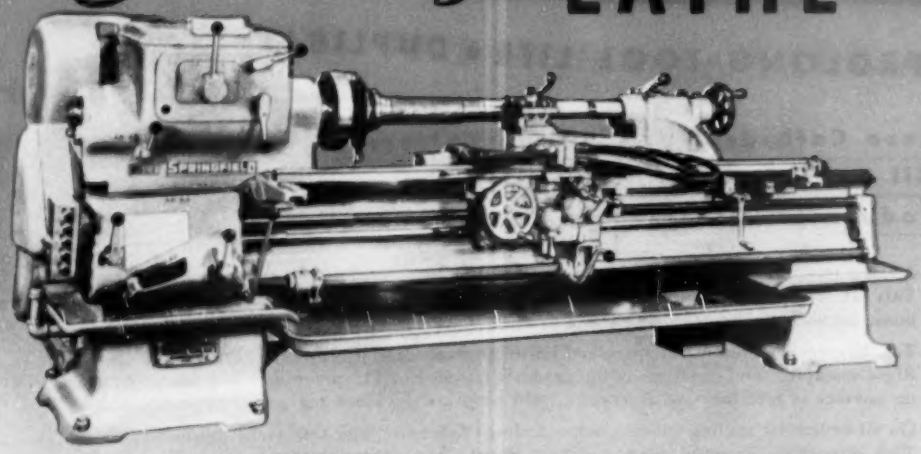
Barber-Colman Company

GENERAL OFFICES AND PLANT, 511 ROOD STREET, ROCKFORD, ILLINOIS, U.S.A.

BARBER COLMAN

SPRINGFIELD

Contouring LATHE



The simplicity of the SPRINGFIELD Hydraulic Contouring Attachment is outstanding. Pilot or control circuits, remote control valves and other troublesome elements are eliminated. A motor driven hydraulic pump, relief valve and oil reservoir are the self-contained power unit furnishing hydraulic pressure to the servo-valve and full universal hydraulic compound rest. A supported and guided adjustable template holder conveniently holds templates at the front of the lathe in full view of the operator. There are no complicated mechanisms or fragile units.

SPRINGFIELD Hydraulic Contouring lends itself perfectly to lower production costs per unit on large or small runs.

Opposed hydraulic pressures in the hydraulic cylinder hold the slide solidly for heavy duty cutting.

Full universal hydraulic compound swivels to the best angle for contouring each individual job.

Standard SPRINGFIELD Lathes with swings from 14" to 32" are used in conjunction with the hydraulic contouring attachment thus giving complete standardization of components.

Quick changeover from standard SPRINGFIELD Engine Lathe operation to contouring is made easily.

Positive, smooth, continuous, backlash-free hydraulic movement gives superior finish on turning, boring or facing.

Close coupling of stylus, servo-valve and cylinder eliminate long hydraulic lines, sluggish action and resulting inaccuracies. The SPRINGFIELD Hydraulic Contouring attachment does not reduce the normal swing capacity of the lathe.

Write for Bulletin No. 184

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Progressive

SCREW MACHINE DEPARTMENTS STANDARDIZE

with

HARDINGE

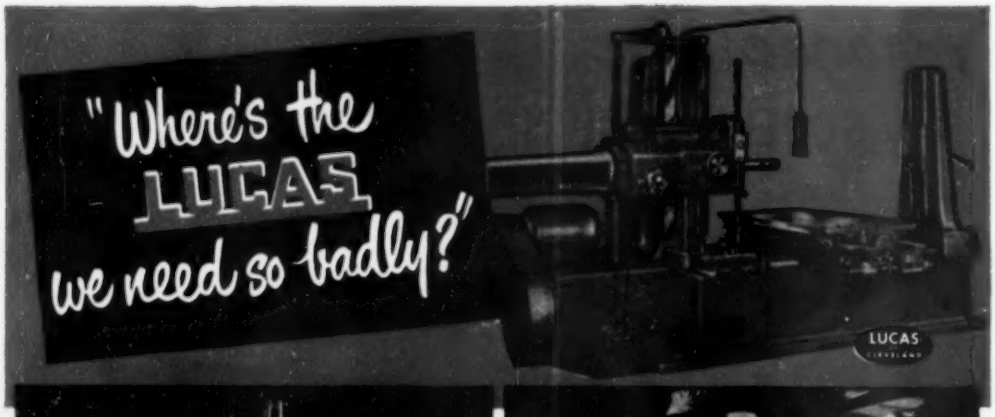
Collets - Feed Fingers - Pads

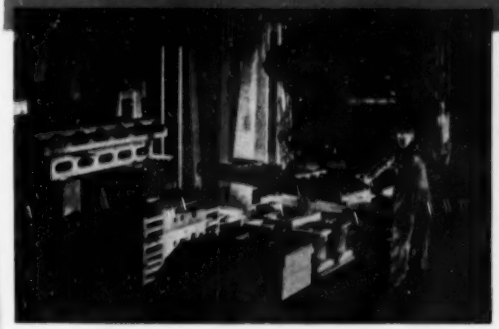
for

All Automatics, Turret Lathes,
Tool Room Lathes and Millers

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

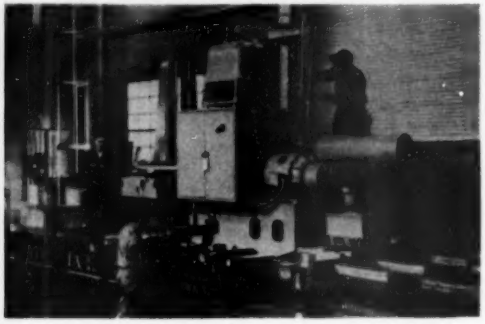




The ultra modern Lucas plant is being used to full capacity with work in process and rough castings waiting to be machined.

Lucas machines at work making components for more Lucas machines, in our plant and in the shops of many outside suppliers.

Still no sacrifice of Lucas standards. Ultra modern production methods, but still the skilled hand craftsmanship for which there's no satisfactory substitute.



More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.

Your inquiry and your order are as welcome as ever at Lucas. Today's conditions won't last forever and your Lucas Horizontal Boring Milling and Drilling machine will always be a time saving money maker.

THE NEW BRITAIN MACHINE COMPANY
LUCAS
CLEVELAND

LUCAS
Precision
HORIZONTAL BORING MILLING AND DRILLING MACHINES

LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 2, OHIO

- "Key instrument in inspection"
- "Protects quality prestige"
- "Customers' rejections less than 1/50 of one per cent"
- "Saves from $3 to $5 per hour"

Photo Courtesy of Modern Corp., Detroit, Mich.

Modern Corporation, Detroit, Mich., manufacturer of fine MODCO cutting tools, says this about their new 30-inch J & L Comparator:

"Modern Corporation's new 30-inch J&L Comparator has become the key instrument in the inspection of fine MODCO tools. Its size enables the inspector to examine the complete contour of most tools, without transfer of reference points, and thus without the chance for human error to creep in.

While the primary reason Modern Corporation bought the Comparator was to promote inspection accuracy, it is showing an important cost saving: Every time the J&L Comparator is used, it saves from three to five dollars per hour, depending on the tool under inspection!"

This instrument is one of 14 J & L Comparators in the Modern Corporation plant, and the largest.

P.S.

Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL — *throughout your production lines.* Write for Catalog No. 402. One of our eleven models will fit your needs.

Jones & Lamson Machine Company
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME _____ TITLE _____

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JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Machine Tool Craftsmen Since 1835

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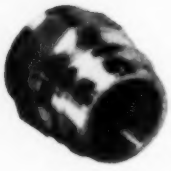
STANICUT
TRADE MARK
Cutting Oil



Combines better finish, longer tool life

Manufacturers of this aluminum alloy valve had two objectives in mind when they asked their Standard Oil lubrication specialist for his recommendations on a cutting oil. They were looking for a better finish on their product and longer life for their cutting tools.

STANICUT Oil 62 FC answered their needs. Used as a base oil, it replaced a soluble oil emulsion previously used. The finish is more than satisfactory and operators are obtaining 4,000 to 5,000 pieces per grind. While the job was originally set up on a basis of 97 pieces per hour, production now runs 125 pieces per hour.

To put STANICUT to work to similar advantage in your own screw machine department, or for help in solving any problem in industrial lubrication, call for the services of your own Standard Oil lubrication specialist. Contact your nearest Standard Oil office or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

W. R. Winter, of Standard Oil's Milwaukee office, has worked closely with the industrial plants in his area for many years and was able to offer operators of this plant the kind of help they needed when they needed it. His recommendation for the use of STANICUT Cutting Oil resulted in important savings for the manufacturer.

Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools. And like all lubrication specialists, his on-the-job help is always available. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest.

For help with your problem, call for the services of your Standard Oil lubrication specialist today! A call to your local Standard Oil office is all that's necessary.

Send for this booklet

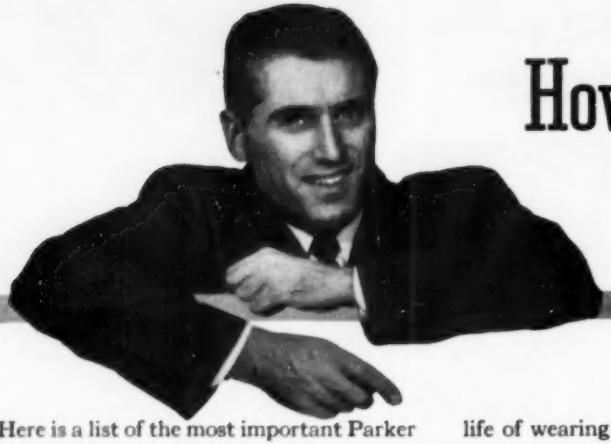
SEE WHAT STANOIL OFFERS YOU

STANDARD

STANDARD OIL COMPANY

(I N D I A N A)

• You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in a wide variety of equipment. Ask the Standard lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

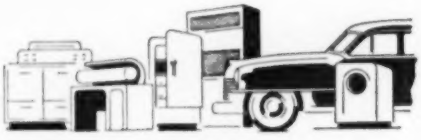


How many of you use

Here is a list of the most important Parker Products used in the metal working industry today. It's an expanding list, growing as Parker research develops new products to broaden the field of metal treatment.

Some of these products add durability and protect appearance by anchoring the paint and controlling corrosion. Another enhances performance and prolongs the life of wearing surfaces. Others bring important benefits to production lines, making new techniques practical, improving conventional operations.

Every Parker Product listed here has proved itself. Each one is formulated and manufactured to the high Parker standard of quality to work for you with highest efficiency, dependability and economy.



☐ BONDERITE

The standard surface preparation method for metals to produce paint finishes of highest quality. Bonderite converts the surface to a nonmetallic phosphate coating, integral with the metal, which is an excellent anchor for paint and an effective corrosion resistant. An adaptable product, simply applied in spray or immersion equipment, easily controlled for dependable results. Used widely, on the world's most famous and admired manufactured products.

☐ BONDERITE AND BONDERLUBES

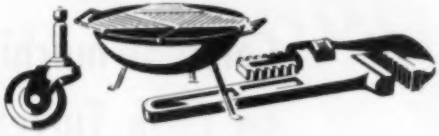
Cold forming of metals is faster, easier, and more economical of time and metal because of this proven combination. Bonderite and Bonderlube combine to form a lubrication system that makes metals flow smoothly, lengthens die life, cuts metal loss. Years of experience are behind this Parker development—90% of all seamless steel tubing (and millions of feet of welded steel tube) is drawn with Bonderite. Many Ordnance items are now being manufactured with this aid.

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

these **PARKER PRODUCTS** do to make your metal products better?

☐ **PARCO LUBRITE**

On gears, cylinder walls, pistons, rings, shafts, valves and rods, Parco Lubrite is used to create a nonmetallic phosphate coating on the metal. This coating holds lubrication under pressure, prevents metal-to-metal contact and resulting scuffing and scoring during initial operation. The smooth, easy break-in with Parco Lubrite makes for longer subsequent service life.

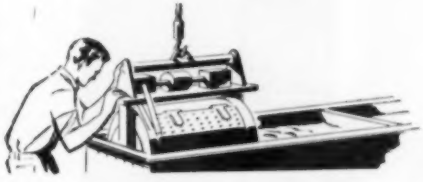


☐ **PARCO COMPOUND**

For 35 years, this Parker product has meant quality rust resistance for iron and steel. The dense crystalline phosphate coating becomes integral with the metal and forms an excellent base for rust preventive oil or paint finishes. Any iron or steel article, small or large, simple or complex, may be treated with Parco Compound.

☐ **PARCOLACS**

A useful group of specialized products made up of various finishes for use after Parco Compound. Includes wax base finishes, stains, and rust preventive oils suitable for dip, spray or centrifuge application. Available for quick or slow drying requirements. Parcolacs add desirable appearance and performance qualities to articles treated.



☐ **PARCO CLEANERS**

An outstanding line of metal cleaners formulated to condition the metal for the next step in finishing, as well as to remove grease and soil efficiently. Alkali, acid, and emulsion types, each formulated to meet certain conditions of soil, production requirements, and finishing operations which follow.

PARKER PRODUCTS MEET GOVERNMENT SPECIFICATIONS

Parker RUST PROOF COMPANY, DETROIT 11, MICH.

Mail this coupon today!

Please send me information on products checked:

- ☐ Bonderite
- ☐ Bonderite and Bonderlube
- ☐ Parco Lubrite
- ☐ Parco Compound
- ☐ Parcolacs
- ☐ Parco Cleaners

PARKER RUST PROOF COMPANY
2196 E. Milwaukee, Detroit 11, Michigan

NAME_____

FIRM_____

ADDRESS_____

Another Bottleneck

Colonial machine broaches 294 teeth on Tank Turret Gears in *30 minutes!*

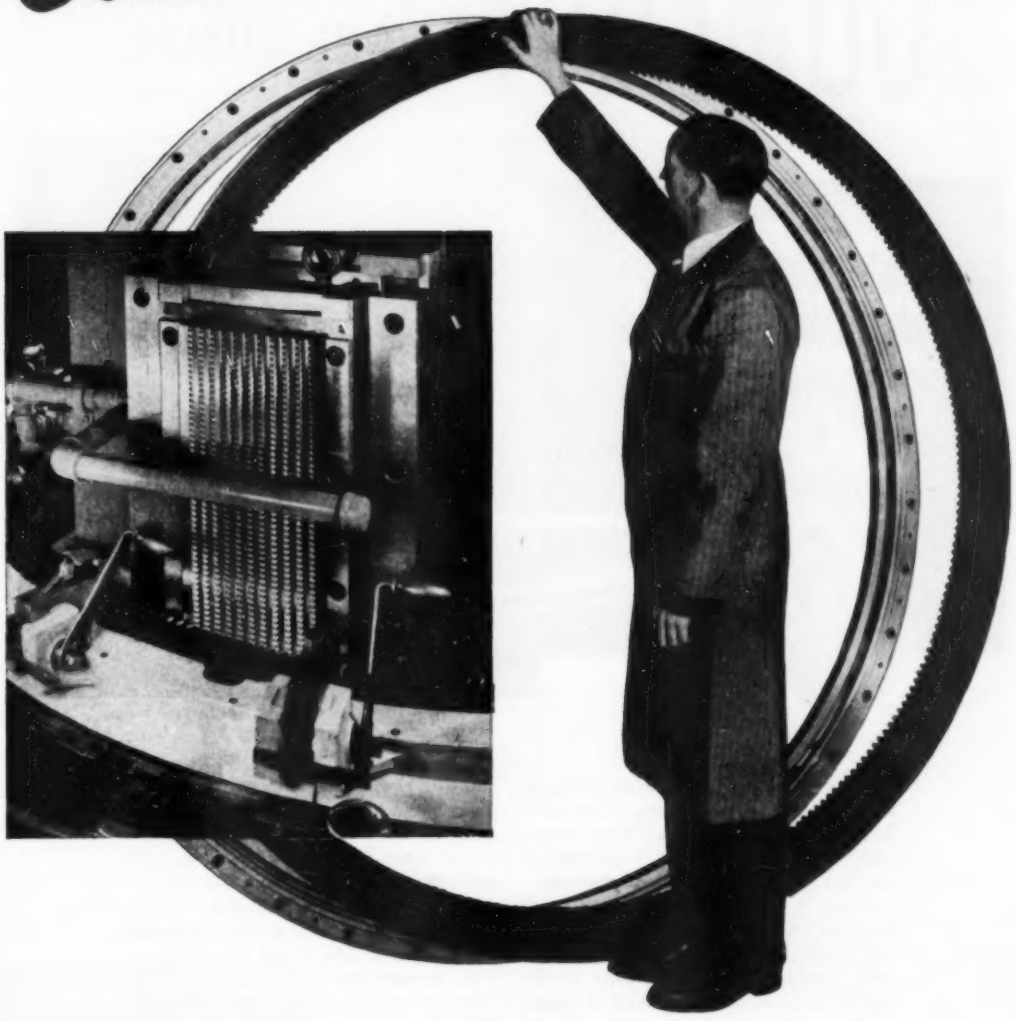
Working as a team, production officials of the Detroit Tank Arsenal and Colonial Broach Company have removed one of the tough production bottlenecks in tank output—cutting the big precision teeth in the turret ring gear.

Using conventional methods, 4½ hours of cutting time are required to produce the 294 four-pitch teeth in each 6 foot pitch diameter gear. By an ingenious method of indexing the gear AROUND the column of a surface broaching machine and broaching 11 teeth during each cutting stroke, total cutting time now has been reduced to only 30 MINUTES!

An idea of the precision obtained is that no gear tooth finishing operations are required after broaching—yet spacing is held to .001 in. and eccentricity to .0005 in. per foot of diameter.

It takes a combination of imagination and long, practical experience to turn out installations like this—which not only speed output but cut costs and insure real precision. Colonial engineers give you that combination. They have been modernizing metal cutting methods for industry for well over a quarter-century.

Eliminated



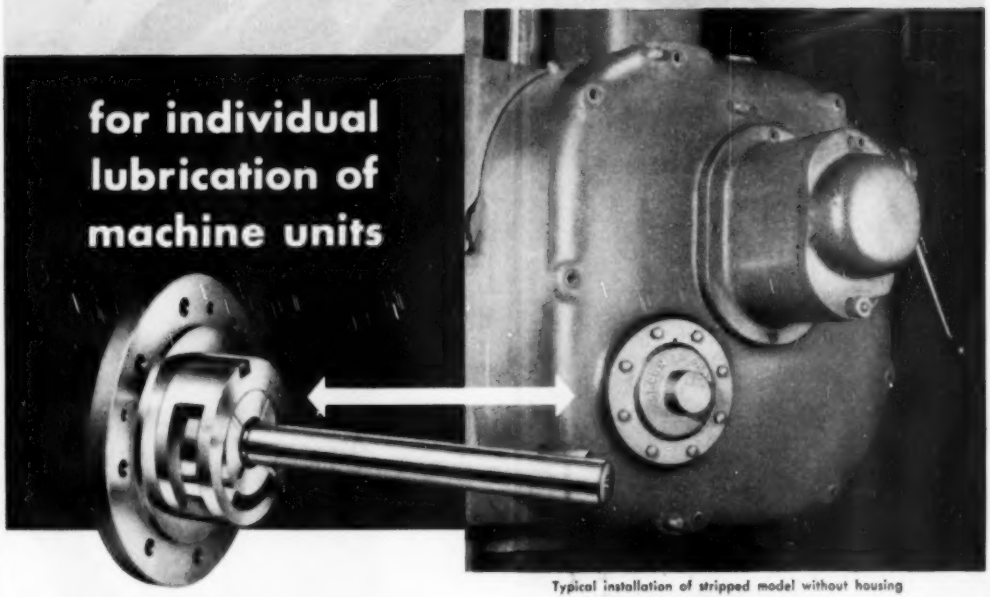
PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

COMPACT AUTOMATIC REVERSING VANE PUMPS...

for individual lubrication of machine units



Typical installation of stripped model without housing in modern metal-working machine.

You get modern appearance when you equip machines with stripped models of Brown & Sharpe Automatic Reversing Vane Pumps. They're extremely compact . . . yet sturdily built for continuous, trouble-free service.

Brown & Sharpe *Stripped Models with housings* (Nos. 8022, 8062, and 8102) are very easily installed, particularly where internal discharge and suction ports are not readily incorporated in the machine design or when outside piping is desirable. *Stripped Models without housing* (Nos. 8023, 8063 and 8103) wherever installed, offer minimum projection from machine surfaces. Designed for use as integral parts of machines where suction and discharge ports can be incorporated in machine castings.

Fully-automatic reversing with unidirectional flow is a feature of all these pumps. Sizes available: 2½, 5 and 11½ g.p.m. at 0 lbs. pressure and at 1140 rpm. These and other features are fully described in Bulletin. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Visit Booth No. 1435
A. S. T. E. Show, Chicago.

Brown & Sharpe B·S

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

Users Pick A-H5 in Survey of Air-Hardening Steels

Several years ago we had to make up our minds whether we were going to continue to promote the 2 pct chromium type of air-hardening tool steel or the newer 5 pct chromium type. Both are general-purpose die steels. In other words, plenty of wear-resistance is a must — plus sufficient shock-resistance for cold work.

The big question was to decide which was more important — the lower annealed hardness and easier machining of A-H5 (the 5 pct chromium steel) or the lower quenching temperature of the 2 pct chromium type.

We made an investigation among major users of tool steel, heat-treaters, and others. And here's what we found they wanted most, in order of importance:

1. Maximum wear
2. Minimum distortion in heat-treatment
3. Easy machining
4. Adequate shock-resistance
5. Low quenching temperature

It was a clear-cut vote for A-H5. And when the question of shock-resistance was discussed, they agreed, "If it's a shock job, then use a regular shock tool steel like Bethlehem Omega or 67 Chisel."

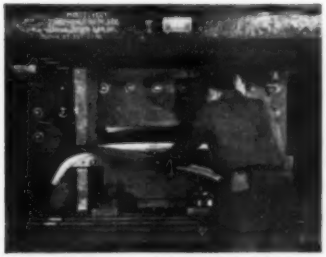
Our decision to carry rather complete stocks of A-H5 has been fully justified by the swing to the 5 pct chrome grade. We've watched A-H5 reach a new high in popularity for jobs that call for safe hardening, very little distortion, and high wear-resistance.

Users say:

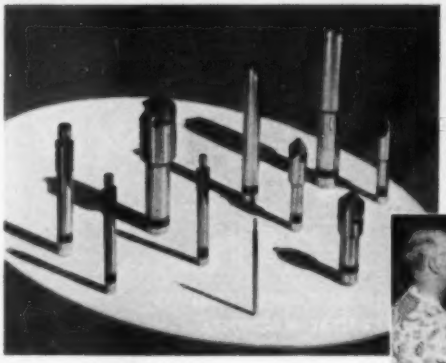
"... Never had such fine service from dies."

"Don't know what it is to have cracked dies any more."

"... I've cut my costs on grinding and stoning many times since using A-H5."



Edges stay sharp on this trimmer die of A-H5 which removes ragged metal from sheet-steel parts.



These precision cutting tools are made from Bethlehem 66HS, our moly-tungsten high-speed steel. The CTC trademark appears in the undercut bands on the shank of each tool.

Final dimensions are checked on a main rotor balance stand for use by several helicopter manufacturers. Built by Custom Tool, this special fixture has a tip made of Bethlehem 67 Chisel tool steel.

Custom Tools made from Standard Tool Steels

It takes a variety of Bethlehem tool steels to meet the needs of Custom Tool Co., North Hollywood, Calif. Makers of special tools, especially those required in aircraft repair and assembly, this firm is the outgrowth of a home workshop where Ben Sprague, president of the company, began to make his own special tools to make the overhauling of aircraft an easier job.

Today the CTC trademark appears in the black band on the shank of countersinks, counterbores, hollow mills, special wrenches, fixtures and jigs. Quality steel and careful heat-treatment go hand in hand with the precision machining of tools made to close tolerances.

Here's a fine example of how many tool and die jobs are handled by standard tool steels. The CTC cutting tools are ordinarily made from Bethlehem Special HS, our standard 18-4-1 type of high-speed steel. But tungsten conservation measures now require the use of our moly-tungsten steel, Bethlehem 66HS.

Tools subject to heavy shock or impact loads are made either from Omega, our silico-manganese tool steel, or 67 Chisel, the chrome-tungsten type.

BTR, our manganese oil-hardening tool steel, was used recently by Custom Tool in a new series of screw gages which have been designed to set up standards for aircraft fasteners.

Our Tool Steel Engineer Says: *Use extra care in quenching large sections of carbon tool steel*

Large tools made of carbon tool steel can be cracked very easily during quenching. A quench which only partially hardens a tool made of carbon tool steel is more likely to cause cracking than a quench which produces full hardening.

A quench which produces soft spots in the chill of carbon tool steel can cause cracking which is violent enough to be classed as an explosion — the tool may literally break up into a number of pieces.

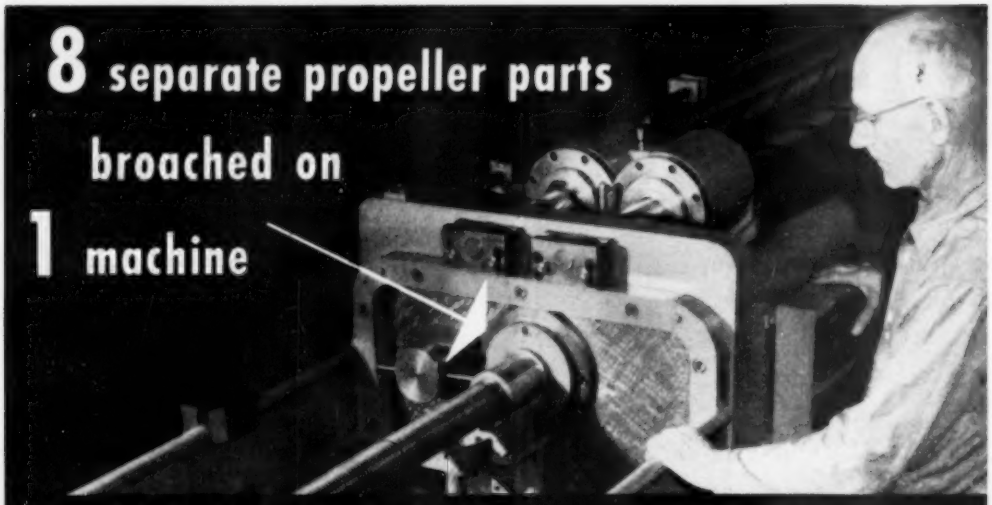
Ineffective quenching which causes soft spots may result from:

Use of fresh water containing dissolved air ... use of water contaminated by soap, oil, etc. ... insufficient quantity of quenching solution ... inadequate agitation in the quench.

A drastic quench in brine which produces a uniform chill is necessary to avoid cracking large tools when they're made from carbon tool steel.

Bethlehem ULTRASONIC TESTED **Tool Steel**

8 separate propeller parts broached on 1 machine



A PROPELLER MANUFACTURER GOT THESE BENEFITS FROM HIS AMERICAN HORIZONTAL MACHINE:

1. **Tooling is readily inter-changeable for eight separate parts of short run production.**
2. **Large parts are easily loaded and unloaded.**
3. **Double helical drive for right and left hand helix readily adaptable to machine.**
4. **The horizontal machine provided the most tonnage and stroke per dollar invested.**

To broach the propeller sleeve gears, American built and equipped a standard HDE-30-72 horizontal broaching machine with six interchangeable lead bars for different internal spline operations. The machine broaches eight different propeller sleeve gears. Number of spline teeth vary from 43 to 55 with diameters ranging from 2¾″ to 3½″, and part lengths ranging from ¾″ to 3″ long. Ask American which type of machine best suits your requirements. Just send a part print and hourly requirements for our recommendations.

AMERICAN

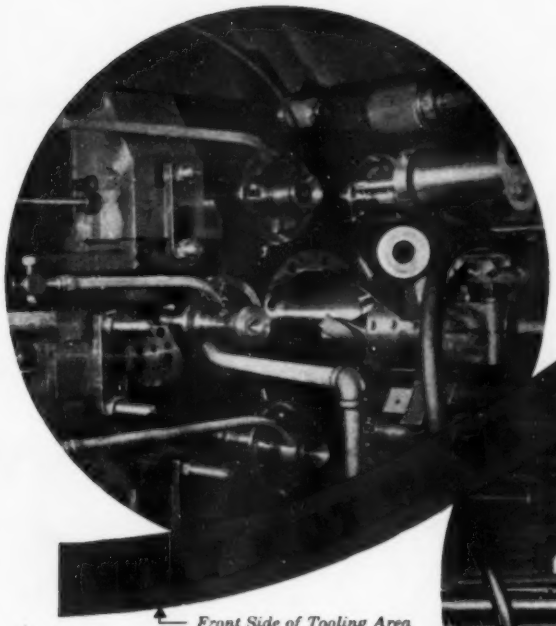
American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

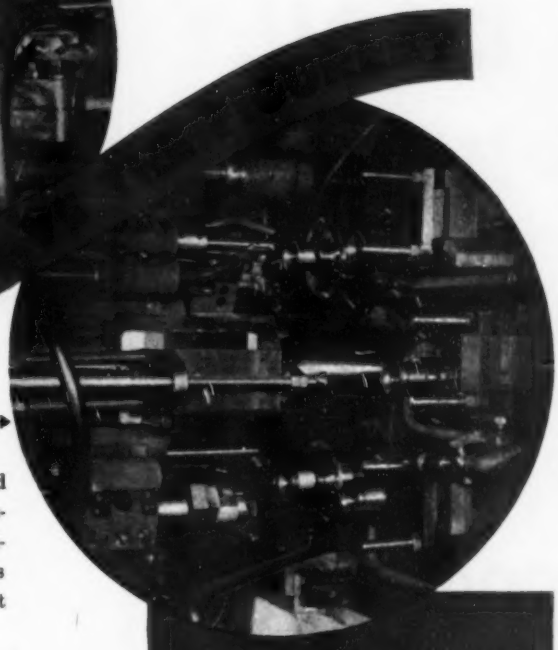
ANN ARBOR, MICHIGAN

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Front Side of Tooling Area
Rear Side of Tooling Area

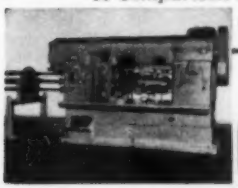


If you have a tough forming job in mind for a new "automatic," it's more satisfactory to know the recommended maximum load of the proposed machine's cross slides than to merely be told that they are *rugged.*

Before a machine can satisfy an important requirement it must be *built that way.* And built to figures instead of adjectives.

There are many factors involved in the building of any brand of Multiple Spindle Bar Automatic, factors on which you may want the figures. You may have the figures on CONOMATICS.

A Comparison of ALL Automatics is in Favor of Cone

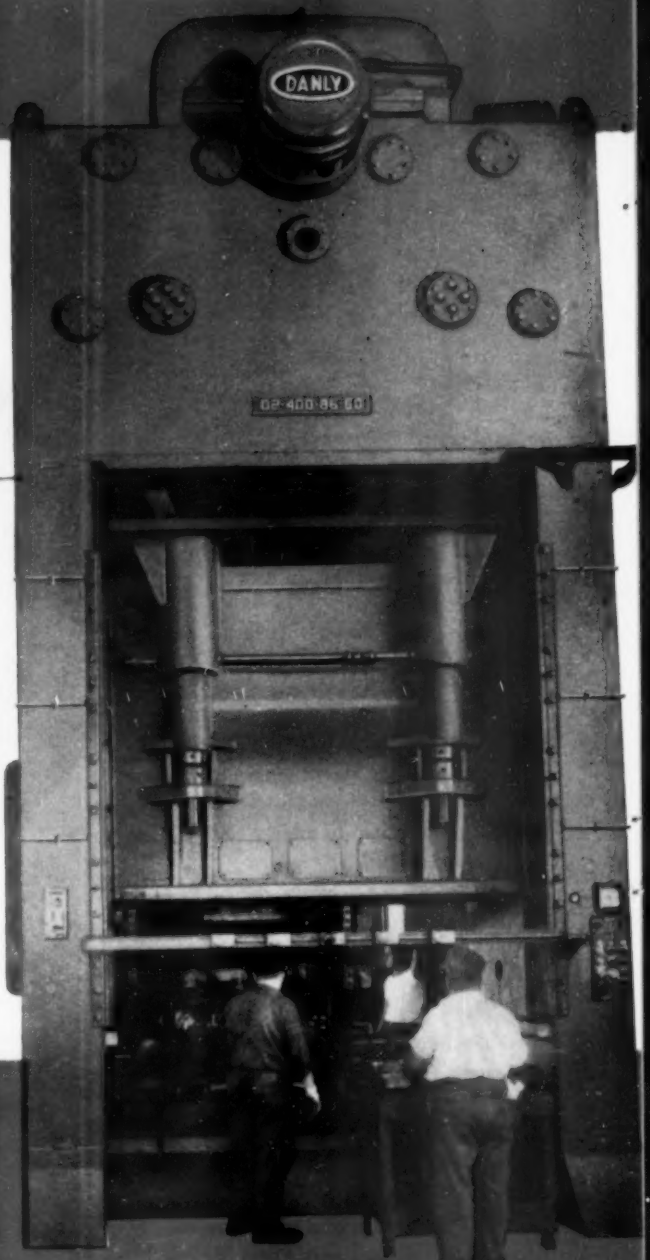


In producing the alloy steel part shown, the maximum load recommendation for each main cross slide of the 3½-SIX is 8,000 foot pounds. The total net weight of the main cross slides is 825 pounds.

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

DANLY PRESSES

BUILT TO BEAT PRODUCTION RECORDS!



HEADING THE LINE . . .

This 400 ton Danly Double Action Press performs the first drawing operations on a variety of pieces, setting the pace for the entire line. Close access to the die area speeds die changing.

. . . at the Marion Industries Division of Motor Products Corporation, Marion, Ohio

Ability to meet emergency schedules . . . to keep running day after day under maximum load conditions . . . is built into every Danly Press. Exclusive design features like the Danly Cool-Running Clutch and extra rigid, precise construction throughout assure longer uninterrupted production runs—less down time for routine maintenance.

That's why you find more and more *complete lines* of Danly Presses in leading stamping plants like this. Smoother, quieter and easier to operate, Danly Presses are preferred by press room personnel too!

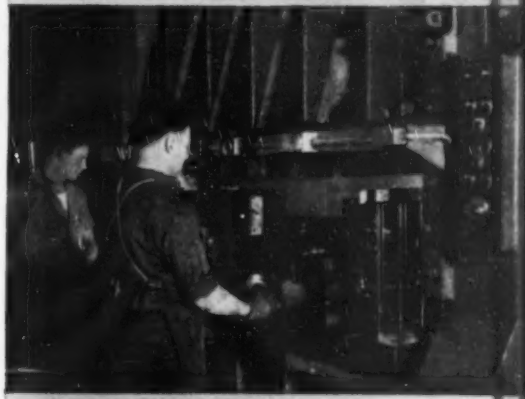
Call a Danly Engineer today and see how Danly Presses, engineered to meet your specific requirements, will make your press room more efficient.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

Mechanical Presses . . . 50 to 3000 tons

Straight Side · Autofeed · Gap Frame · Double Action · Underdrive

PRODUCTION FLOW . . .
where a sequence of stamping operations is performed continuously on a line, each press is vitally important. Every press in the two lines shown here is a Danly.

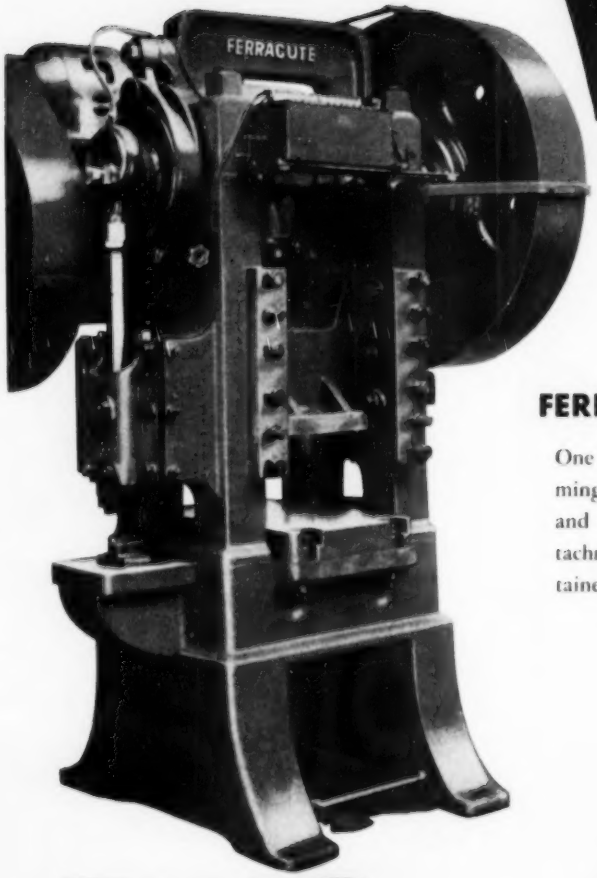


EXTRA SAFETY . . .
Danly Press Controls protect operators and equipment too. Here, two operators independently feed separate dies in the same press with maximum safety. In this setup, it is required that each operator engage two run buttons during most of the down stroke before the press will complete the cycle.

DANLY

IT COSTS LESS TO RUN A DANLY PRESS

TRIM YOUR COSTS
ON FORGINGS WITH
FERRACUTE
TRIMMING PRESSES



FERRACUTE PRESS DPG-55

One of a series of heavy-duty, rugged trimming presses. 40 to 400 tons. Geared type and equipped with outside trimming attachment. Soundly engineered for sustained production and low maintenance.

Write for full specifications.
Prompt delivery.

FERRACUTE **MACHINE COMPANY**

Power Presses—Since 1863—Special Machinery

Bridgeton, New Jersey, U.S.A.

POPE
LEADS THE PRECISION SPINDLE PARADE

Tell us about the job so we can recommend the right Spindle and give you price and delivery estimates.

Specify POPE whatever the Spindle application, type or size,

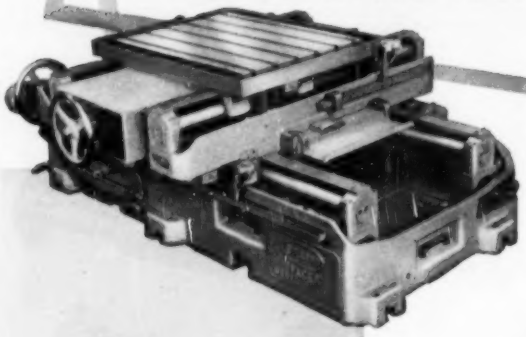
— for continuous, peak production of accurate parts with finely and uniformly finished surfaces.

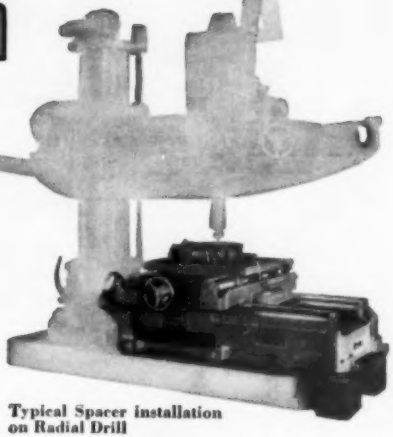
— for cool operation at high speeds over long periods. The POPE System of lubrication requires no further addition or attention for the operating life of the bearings.

No. 83

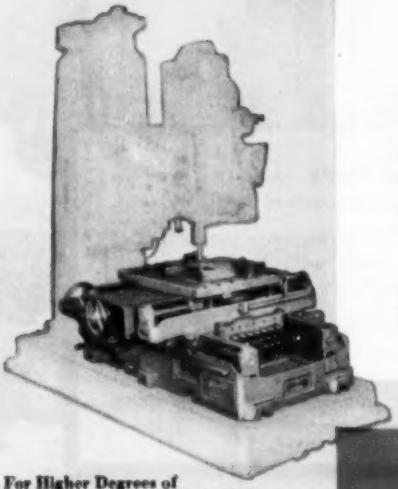
POPE

EVOLUTION.....
FIRST JIGS *then*
BULLARD SPACER





Typical Spacer installation on Radial Drill



For Higher Degrees of Accuracy, the Spacer is installed on Cincinnati Super Service fixed arm Drill

Jigs and templates are the old original means of repetitive production of a pattern of accurately spaced holes.

Today, through Evolution and Engineering Skill, Bullard has developed a FASTER, more Accurate and LESS COSTLY Method for this type of work.

Interchangeability of parts in small quantities at minimum cost is most important in modern manufacturing.

NO TIME REQUIRED FOR: —

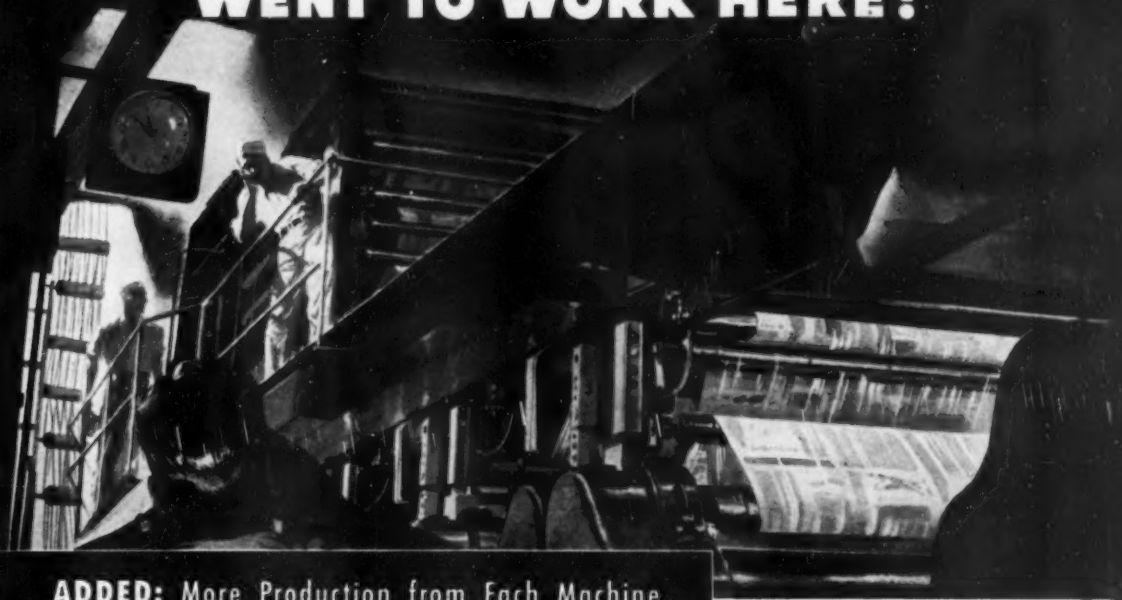
Jig Design **Jig Handling**
Jig Processing **Jig Storing**

NO OPERATOR FATIGUE in locating and relocating of Drill Arm. See further comparisons in Spacer catalog.

When writing, mention "EVOLUTION".

THE BULLARD CO.
BRIDGEPORT 2, CONNECTICUT

Alemite "Friction Fighters" WENT TO WORK HERE!



ADDED: More Production from Each Machine

REDUCED: Stock Spoilage and Down-Time

SAVED: A Total of $4,247 Every Year

Friction was once a daily menace—and a costly one—in this Chicago plant.* Protected only by old-fashioned methods of lubrication, this company's mammoth high-speed presses were breaking down with alarming frequency. Stock spoilage was high. Oil consumption ran to $5,664 a year.

Then, a trained Alemite "Friction-Fighting" specialist was called in to work with the plant engineers. After a month's test on one press an Alemite Mechanized Lubrication System was installed on all five machines in the plant at a total cost of only $2,471.

Since that time, there has not been a single breakdown or bearing loss, stock spoilage and down-time have been greatly reduced, and lubricant cost has been cut to $1,417! This is an annual saving of $4,247, *in addition* to more production gained from each press, and a marked improvement in quality for increased customer satisfaction!

No matter what size or type of plant you operate, an Alemite Lubrication Engineer can show you dozens of ways of making worthwhile savings through more efficient handling of petroleum products. These are facts which you can readily confirm in your own time studies. The Alemite man will cooperate fully with your plant engineers in setting up a test. Contact your local Alemite Industrial Distributor, or mail coupon below—today!

*Name on Request.

ALEMITE

MEANS EVERYTHING FOR LUBRICATION

1. Methods 2. Lubricants 3. Equipment

For industry, Alemite Centralized Lubrication Systems add productive time to machines with faster, more efficient handling and application of lubricants.

Loading . . . transferring . . . applying! Alemite Mechanized Lubrication Methods save time, save work, keep lubricants refinery-clean barrel-to-bearing.

FREE! New Booklet

Please send me:

☐ "11 Ways to Cut Production Cost."

☐ Include Facts on OIL-MIST—the amazing new system that atomizes oil, circulates it to bearings under pressure.

ALEMITE, Dept. C-32
1850 Diversey Parkway, Chicago 14, Ill.

Name _____

Company _____

City _____ State _____

ARMSTRONG

Modern Tooling Calls for *the Correct*

ARMSTRONG TOOL HOLDERS for each operation

In the old days it was a matter of pride with toolmakers to be able to do the work at hand with the tools at hand. It's a credit to their skill that they could devise to cut threads, do cutting-off and facing, as well as many other operations with one ARMSTRONG TURNING TOOL, but, at today's labor cost, this would be an expensive practice. The maximum of productive work and true machining efficiency can only be obtained by providing the correct ARMSTRONG TOOL HOLDERS for each operation.

The Armstrong System of Tool Holders provides specially designed ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers . . . Turning Tools, Boring Tools, Threading Tools, Knurling Tools, Cutting-Off Tools; tool holders with straight shanks, with off-set shanks, rigid tools and "spring" tools . . . special tool holders for high speed steel bits or blades, for ARMIDE (carbide-tipped) Cutters, for ARMALOY (cast alloy) Bits and Blades.

These modern efficient ARMSTRONG TOOL HOLDERS are as available as your telephone for they are carried in stock by your local ARMSTRONG Distributor.

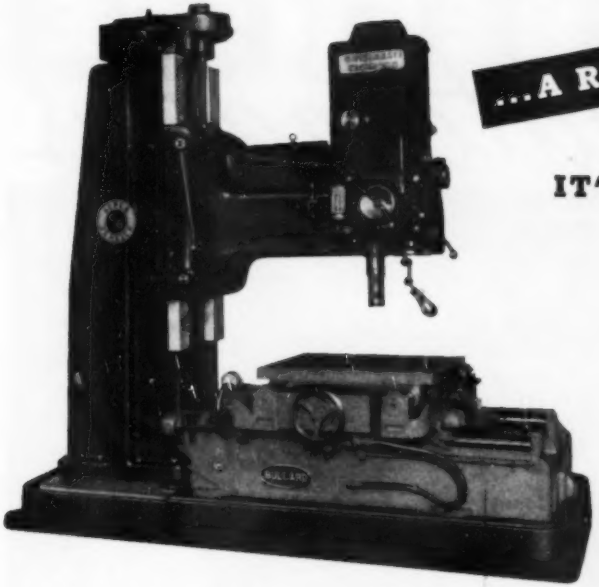
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

Here's thrifty accuracy

...A REAL COMBINATION



IT'S BICKFORD

IT'S BULLARD

...for REPRODUCED ACCURACY without a single jig

Outstanding accuracy, increased production and cost lowering can be assured by using this natural combination of the precision Cincinnati Bickford Drilling Machine and precision Bullard Spacer.

Jig expense, as well as storage and maintenance costs, are eliminated.

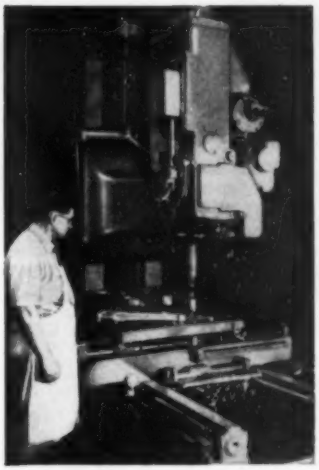
The new job can go into immediate production with interchangeable accuracy, with no lost time waiting for jigs and fixtures to be designed and built.

The wide range of speeds and feeds and the extra rigidity of the spindle and frame of this Cincinnati Bickford Precision Drilling Machine, and the convenience and ease of operator control, assure speed on the job and a wide range of use of the machine.

Actual production time is reduced as no jigs are handled by the operator.

For low cost, increased speed and great accuracy, look into this profit-making combination.

Write for Circular FH.



The Lockheed Aircraft Corporation, Burbank, California, finds the Cincinnati Bickford-Bullard combination ideal for fast, repetitive drilling on a variety of work.

PHOTO COURTESY
LOCKHEED AIRCRAFT CORPORATION

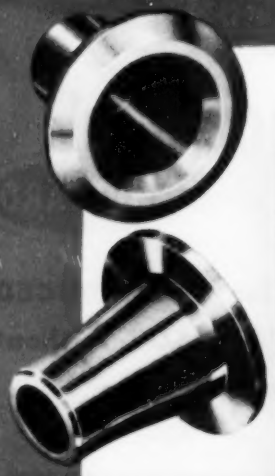
CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

QUICK JOB CHANGES WITH GREENLEE automatics



...INCREASE PROFITS FOR MITCHEL AND SCOTT

The quick change-over features of Greenlee Automatics . . . standardized, interchangeable tool holders, simplified cross-slide camming, rapid stroke-setting arrangement, built-in threading drive, and other important characteristics make them equally adaptable for short or long-run applications.

The Mitchel and Scott Machine Company, Inc., of Indianapolis, Indiana, operate seven Greenlees . . . using them in producing a wide variety of job-shop work. Some of the jobs, such as the one illustrated, run as few as 2000 pieces . . . so set-up time must be reduced substantially to make them show a satisfactory profit.

PRODUCTION MACHINERY
GREENLEE

★ If your production schedules are cramped by long, costly set-ups, we'll be glad to make recommendations.

GREENLEE BROS. & CO. 1723 MASON AVE. ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

to Metalworking's

decade of greatest growth

• • • • • • • • • • • • • • • • • • • •

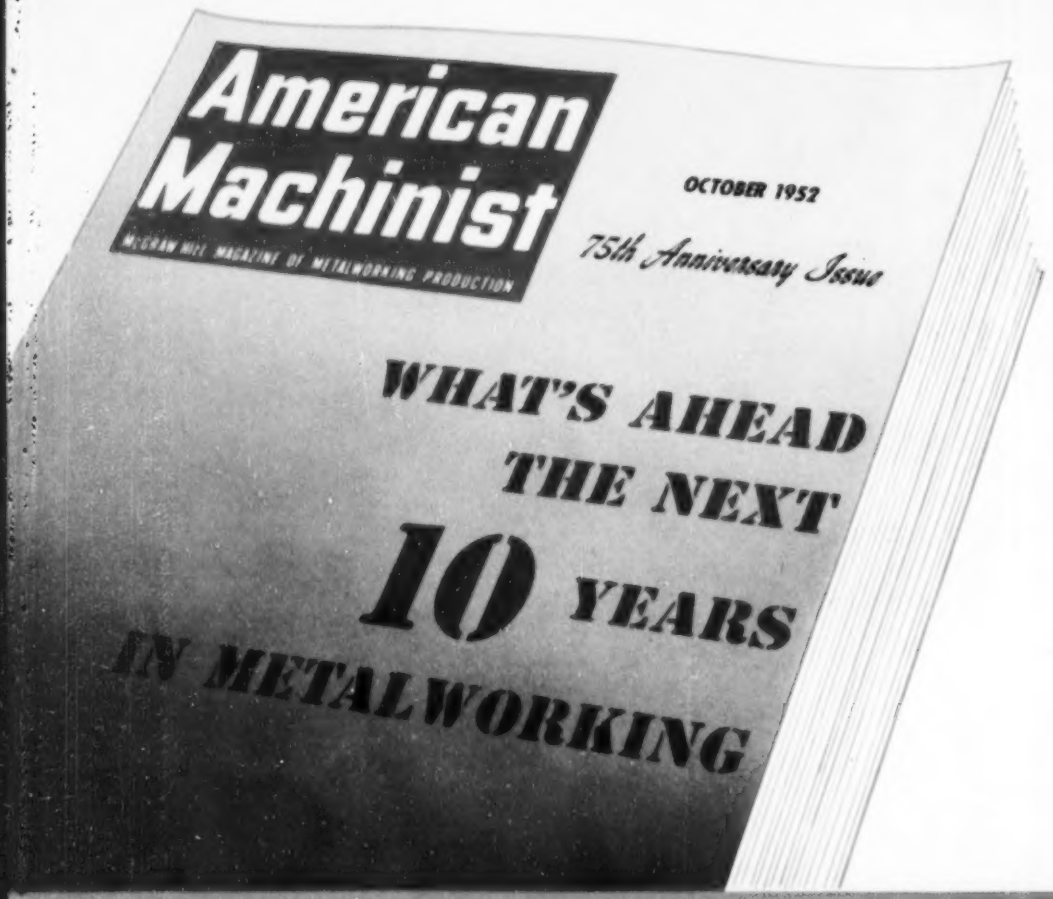
OBJECTIVE: TO HELP YOU

GEAR YOUR COMPANY'S PLANNING

AND PRODUCTION FACILITIES

TO THE CHALLENGING JOB AHEAD

COMING... A GREAT NEW EDITORIAL SER



Next October's **WHAT'S AHEAD** is
more production ideas than you h

In every issue, as you know, AMERICAN MACHINIST brings you a wealth of information on the newest metalworking production methods, equipment, and materials. In a year, this outstanding and practical information fills more than 2,000 editorial pages.

But now... in a period when your markets promise to expand rapidly as the population and buying power of America keep rising... in a decade when America is rearming the free world with the equipment only Metalworking makes... in years which demand that you manufacture better products, and more of them ...we want to give you more help than ever before. And we want to give it to you in the most practical

The facts you want...in easy-to-u
together in one place for long-last

What machinery, equipment, and processes will do the most to boost *your* production efficiency in the years ahead? Which materials and finishes hold the greatest promise? Is your production organization streamlined with today's best systems, and will there be better ones tomorrow? How can you get your production costs down in the face of rising costs?

These are the kinds of questions to which the **WHAT'S AHEAD** issue will bring you abundant answers . . . in

• • • • • A FEW OF THE IMPORTANT SUBJECTS WHICH WILL BE FULLY DISCUSSED AND

ERVICE FROM YOUR MOST USEFUL MAGAZINE

AD issue will bring you
you have ever had before...

IST and efficient way possible.
est
nd The answer is our **WHAT'S AHEAD** issue. Between
cal its covers, our editors will bring you more facts and new ideas on production methods and equipment than you have ever had at your fingertips before. And *all*
ise of them will be of even greater value to you because
ver this issue will also provide... as a broad base upon
ica which to plan your company's production needs... a
nly thorough analysis of the economic factors important
nat to Metalworking's future growth and markets. Abun-
em dant charts, tables, and research data will give you
re. these essential background facts in quick-reading,
cal ready-reference form.

-to-use form...
g-lasting reference

the each of the major subject classifications illustrated
ars below, plus all of these, too, and more:
est
ed Machine tools and machining techniques of all kinds...
nes Coolants, cutting materials, and other production
sts necessities . . . Automation and high-speed, high-feed production . . . Welding, soldering, brazing, riveting, and other joining methods . . . Plating, painting, clean-
T'S ing and other finishing processes . . . Inspection meth-
in ods, tools, and equipment . . . Air conditioning, heating and other plant services.

Where will these answers come from? They will come from a wealth of new study and research by AMERICAN MACHINIST's editors in every production field, and from careful review of the best information on every subject which AMERICAN MACHINIST has previously brought to you. And because there is so much information to give you . . . this issue will be SECTIONALIZED by major subject classifications so that you can find any particular facts you want quickly and easily.

Briefly, then, these are the reasons why this **WHAT'S AHEAD** issue will be invaluable to you in planning for the increased and more efficient production tomorrow's markets will demand. And they are also the reasons why this issue will be a valuable, everyday reference source for many years to come.

Why we are expanding our editorial service with this exceptional **extra** issue

In 75 years of thorough, accurate, and far-sighted service, AMERICAN MACHINIST has won the friendship and readership of many thousands more metalworking men than subscribe to any other metalworking publication. The reason is inherent in the simple fact that AMERICAN MACHINIST consistently publishes more facts about your industry, and how you can improve production methods and *results*, than any other magazine in the world.

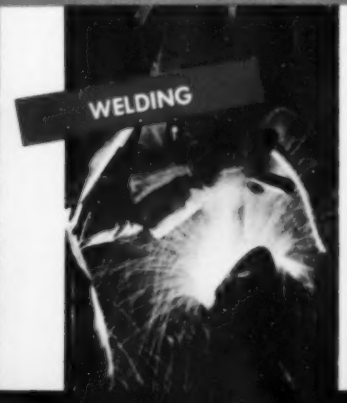
But leadership is never static . . . and AMERICAN MACHINIST intends always to expand its editorial services to you in proportion to the growth in the production problems and opportunities of your industry.

Those production problems and opportunities are growing now . . . fast and across many fronts . . . and AMERICAN MACHINIST's editorial services are growing with them.

In 1952, this growth will be excitingly evident in our **WHAT'S AHEAD** issue. This issue comes to you at a time when the information it will contain is uniquely important. It will help you . . . in every field of metalworking production . . . to plan how to manufacture better products, more efficiently, at lower cost.

If October seems to you a long time to wait for the wealth of information this great issue will bring you, remember, please, that its editing is a very big job . . . involving many thousands of editorial hours. Many weeks of work on this issue are already behind our editors . . . and in the months ahead they may be directly in touch with you for some of the facts they need to make this issue a completely useful and thoroughly documented forecast of **WHAT'S AHEAD THE NEXT 10 YEARS** in Metalworking . . . 10 years of growth and challenge to every metalworking-production executive.

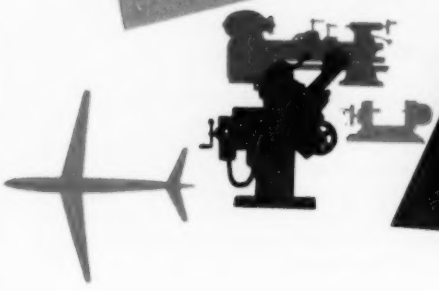
AND EXPLORED IN THE WHAT'S AHEAD THE NEXT 10 YEARS ISSUE



American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

looks ahead



to Metalworking's

decade of greatest growth

OBJECTIVE: TO HELP YOU

GEAR YOUR COMPANY'S PLANNING

AND PRODUCTION FACILITIES

TO THE CHALLENGING JOB AHEAD

read...

...next October

and you'll know...

**WHAT'S AHEAD
THE NEXT 10 YEARS
IN METALWORKING**

American Machinist

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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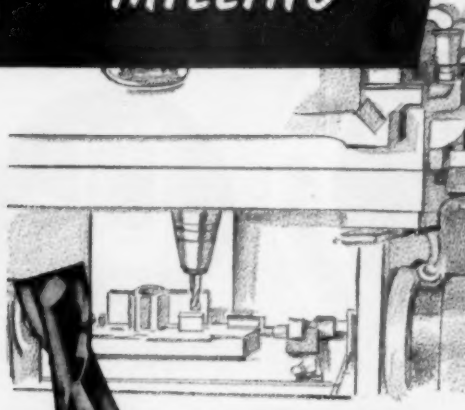

A series of tests on a template
to the user that *Cleveland* E

1—They possess *unusual chi*

2—They permit the use of
of surface finish or tool life.

More than two years ag
pletely redesigned. Si
customers' plants—an
accuracy, strength, d
not experienced the

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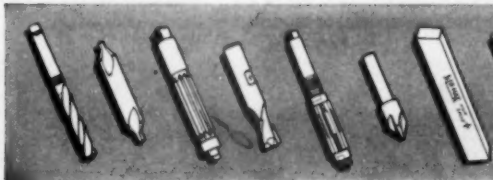

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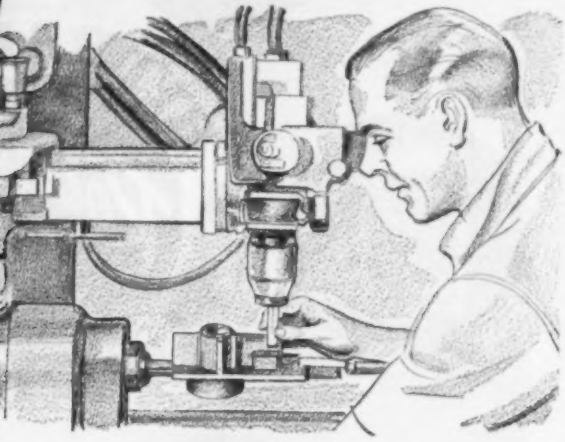

late follower job, illustrated above, proved conclusively
End Mills have two outstanding features:

chip clearing ability.

of higher speeds and feeds than other mills *without loss life.*

s ago the entire line of *Cleveland* End Mills was com-. Since that time they have been tested repeatedly in –and always have been found superior in chip clearing, h, durability, long life and cutting speed. If *you* have the many advantages of these tools, we urge you to . . .

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FOR 101 UNUSUAL JOBS THERE'S NOTHING LIKE A

RODGERS SHOP PRESS

YES, a Rodgers Hydraulic Shop Press is about the handiest piece of equipment you can find for those many pressing, forming, bending and straightening jobs, for die tryout, short production runs and scores of other uses. They are versatile, time-and-labor-saving presses with construction and operating features that make them adaptable to all requirements . . . Standard model presses are available in 60, 80, 100, 150, 200, 300 and 400 ton capacities with hand or power pumps—special or modified units will be supplied to specifications.

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Rodgers Catalog No. 313A has descriptions and specifications on the complete line of Shop Presses.

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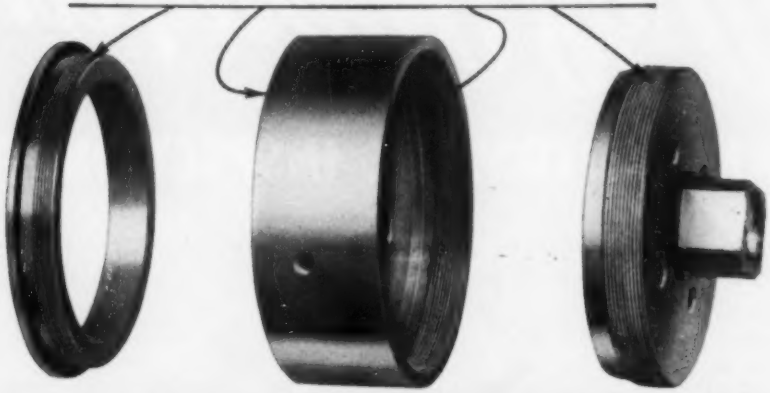
FOR COMPANION-FIT THREADS LIKE THIS:

ALL 40 PITCH...ALL CLASS 3 FIT



USE NAMCO TWINS LIKE THESE:

Style DS Vers-O-Tool—2⅛" Non-Revolving—with ground-thread circular chasers.

Style RST Collapsible Tap—2 3/16" Non-Revolving—with ground-thread blade chasers.

First, look at the diameters of this precision job. They're turned from 2½" brass and aluminum bars.

Then look at the pitch and the fit—40 pitch, class 3.

The natural companions for such companion-fit work are the Namco threading twins, the Vers-O-Tool Circular Chaser Die Head and the Namco Collapsible Tap—both precision built, both properly balanced to maintain production on large lots.

The exclusive Namco micrometer gauge method of checking thread form permits instant-quick chaser change after regrinding, without disturbing the set-up. Continuous, uniform, uninterrupted production is assured—and you'll get 5,000 or more threads per grind.

Cut production time, cut tool costs, cut reject losses—with these Namco Vers-O-Tools and Collapsible Taps. Ask for Catalog D-51—or send us your "specs."

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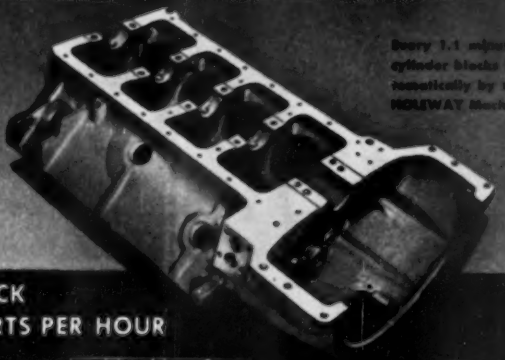
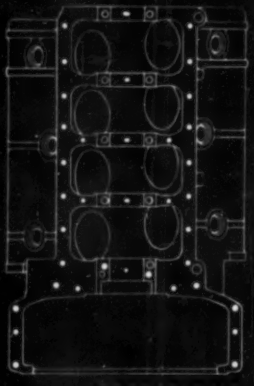
AND AUTOMATIC INSPECTION TOO!

including milling, trepaning, drilling, counterboring, reaming, chamfering, automatic turning of part 360° with vibrations to remove all chips, and automatic inspection.



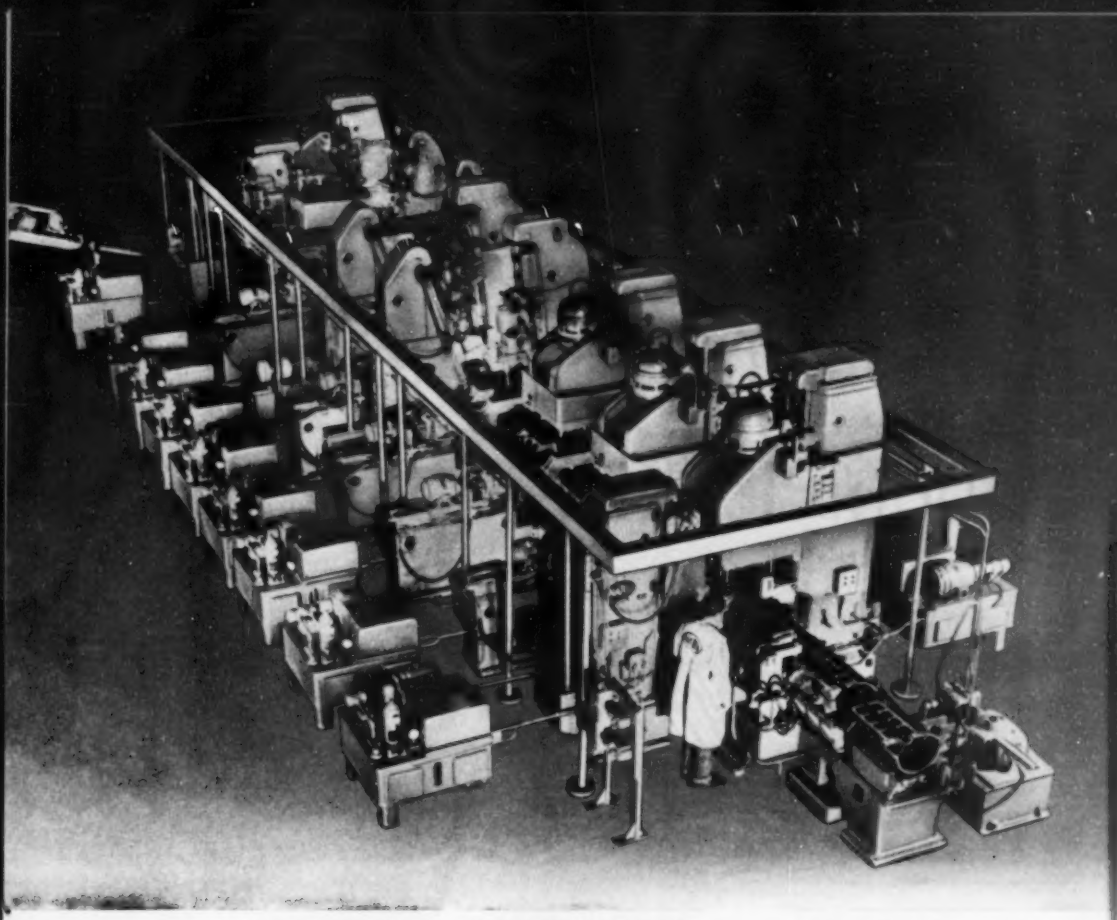
Every 1.1 minutes one of these cylinder blocks is completed automatically by the giant NATCO HOLEWAY Machine.

PART—CYLINDER BLOCK
PRODUCTION—50 PARTS PER HOUR



OPERATIONS

STATION # 1 Load 1 part, pan face up.
STATION # 2
Left Vertical Head
Mill filter pad.
Right Vertical Head
Drill 16 holes to .257" dia.
Drill 2 holes to .368" dia.
Drill 1 hole to ½" dia. 3" deep.
Drill 4 holes to 13/32" dia.
Counterbore 1 hole to 17/32" dia.
Drill 6 holes to ¼" dia. half depth.
STATION # 3 Idle
STATION # 4
Right Vertical Head
Drill 6 holes to .257" dia.
Drill 2 holes to 11/32" dia.
Drill 4 holes to ¼" dia. to depth.
Left Horizontal Head
Trepan 2 holes.
STATION # 5 Idle
STATION # 6
Left Horizontal Head
Drill 2 holes to 5/16" dia.
Drill 1 hole to ½" dia.—3" deep.
Right Vertical Head
Chamfer 24 holes.
Drill 1 hole to ½" dia. to 6" depth.
Rough ream 1 hole to .437" dia.
STATION # 7 Idle
STATION # 8
Left Horizontal Head
Drill 2 holes to 5/16" dia.
Drill 1 hole to ½" dia. to 4" deep.
Left Vertical Angular Head
Drill 1 hole to ¼" dia. half depth.
Right Vertical Angular Head
Drill 1 hole to ¼" dia. half depth.
STATION # 9 Idle
STATION # 10
Left Horizontal Head
Drill 1 hole to ½" dia. to depth.
Chamfer 2 holes.
Left Vertical Angular Head
Drill 1 hole to ¼" dia. to depth.
Right Vertical Angular Head
Drill 1 hole to ¼" dia. to depth.
STATION # 11 Idle
STATION # 12
Right Vertical Angular Head
Drill 4 holes to ¼" dia. half depth.
STATION # 13 Idle
STATION # 14
Right Vertical Angular Head
Drill 4 holes to ¼" dia. to depth.
Left Horizontal Head
Drill 1 hole to ½" dia. to depth.
Chamfer 2 holes.
STATION # 15
Turn 360° and vibrate to dump chips.
STATION # 16
Automatically inspect oil filter pad for broken drills and hole depth. Automatically inspect vertical holes for depth.
STATION # 17
Left Horizontal Head
Buzz the trepan on 2 holes.
Right Vertical Head
Ream 1 hole to .5626" / .5623" and .5726" / .5723" diameters.
Ream 2 holes to .3677" / .3674" dia.
STATION # 18 Unload 1 part.



This single **NATCO** HOLEWAY Automatic Processing Machine completes **ALL 98** pan face operations on this engine block automatically **PLUS** automatic inspection at the rate of 50 parts per hour...nearly one part a minute!

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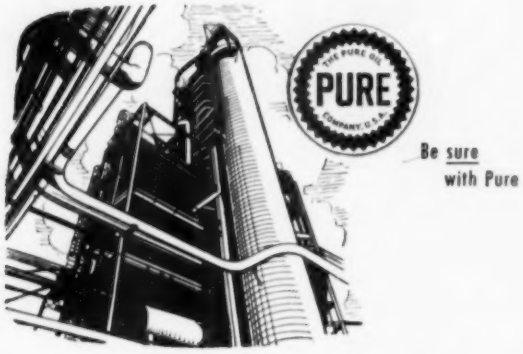
An Important Announcement about Lubricating Costs



The Pure Oil Company's great new lubricants' plant near Beaumont, Texas, is now in full production.

This makes Pure Oil's complete line of top-quality lubricants available to a far greater number of industrial users than it has been up to now.

Many of these lubricants—contrary to usual practice—are designed to do several *different* jobs instead of one specific job, and to do each job *equally well.*

This enables you to do *all* your lubricating with *fewer* lubricants. In other words, you can

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Now!

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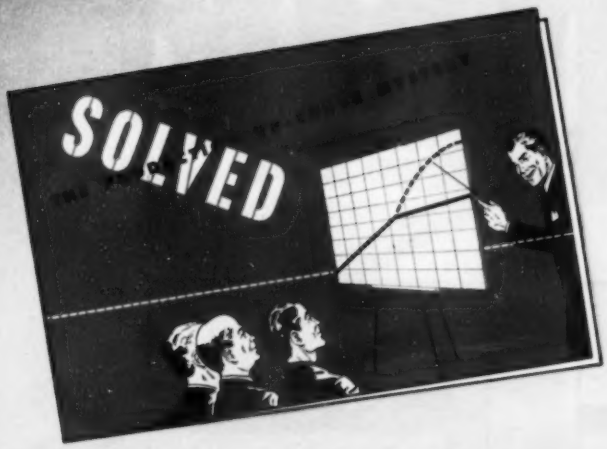
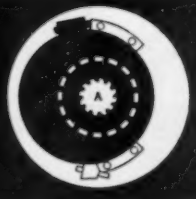
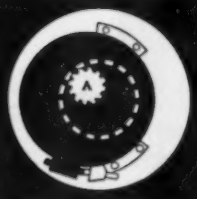


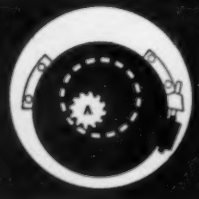
Learn about it by sending for THIS BOOK (coupon below)



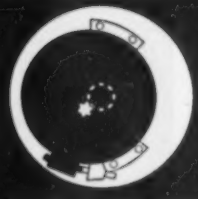
The work (dotted white circle) does not revolve. Cutter is revolved around work.



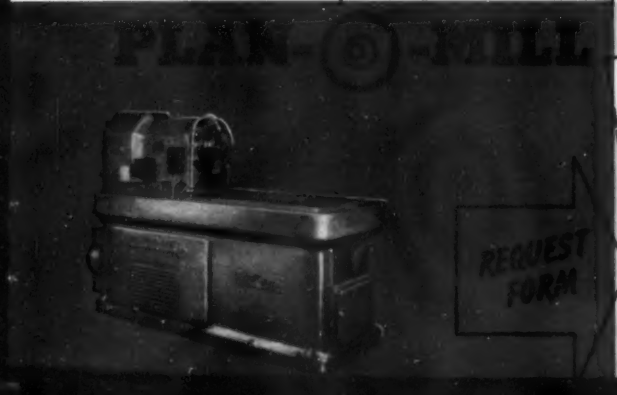
For internal form and thread-milling, cutter (A) moves out from center to contact work.



Cutter moves in circle, completing cut; rapid reverse returns cutter to center.



For external milling, cutter moves in to contact work; then moves around work.



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To pass keen inspection
A tap — or a gal
Must be shaped to perfection.

A is for *ANGLE.*
When not in condition
It's a mighty tough job —
Tappin' — or fishin'.

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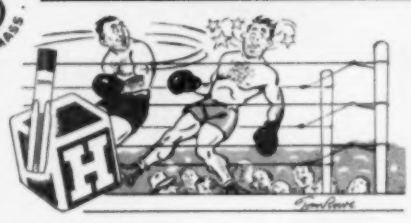
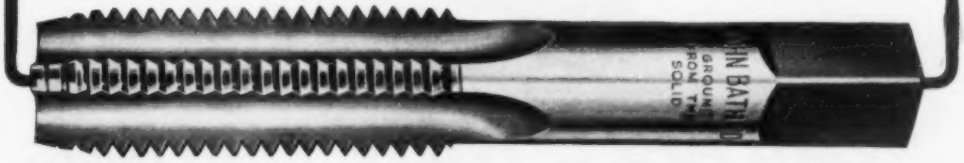
T is for *TEMPER.*
When you apply it with care
To a tap — or at home —
In the "pay-off" you'll share.



H is for *HOOK.*
In a tap cutting face
It makes plenty of difference
At the right time and place.



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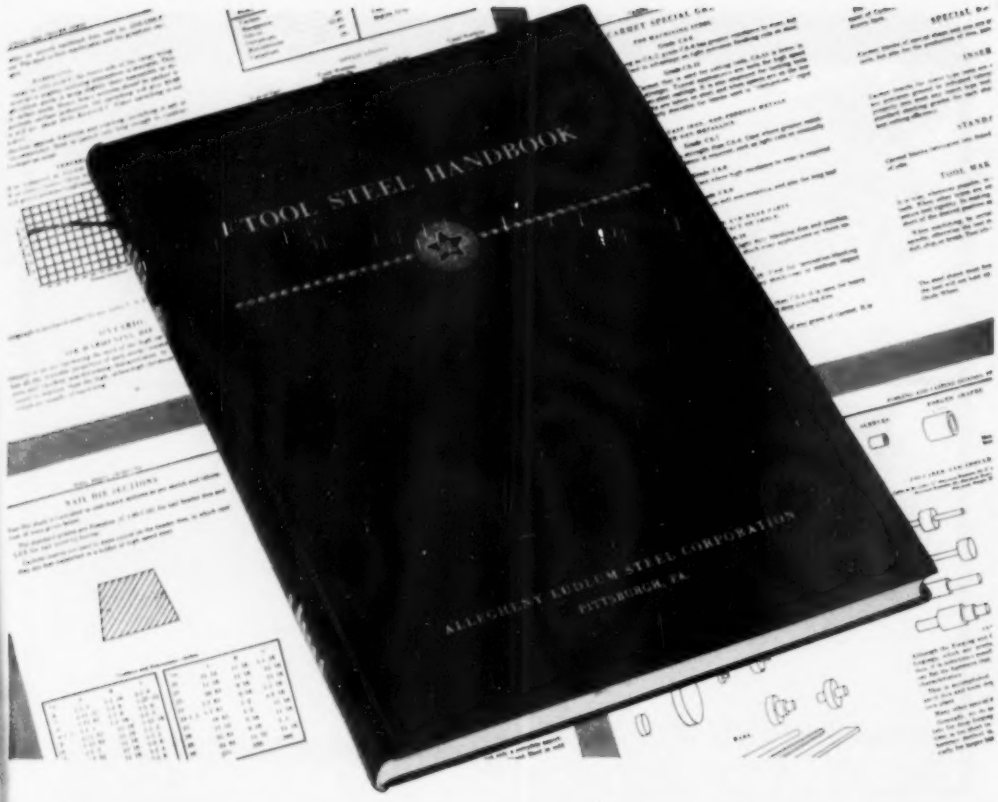

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● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 45 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

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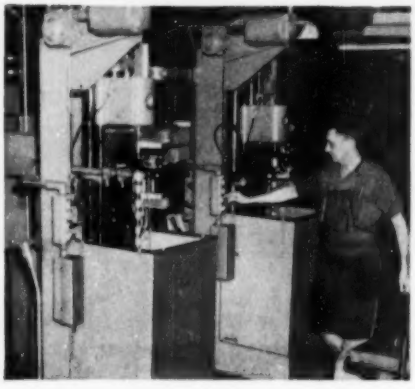
WHICH OF THESE HEAT-TREATING PROBLEMS IS YOURS?

Westinghouse **RF** heating helped Saco-Lowell solve all six



Saco-Lowell Shops, makers of outstanding textile machinery, had always experienced problems with hardened bottom front rolls.

A Westinghouse 50 KW-450 KC RF Generator, with two standard vertical scanners, helped increase line production rates by 145% with total annual savings of $18,300.00. Direct labor costs have been cut 63%. Journal bearings are now ground after hardening, producing a higher quality roll. Formerly, every shaft required straightening; now this operation has been simplified and costs are reduced 70%.

Look at the results obtained by Saco-Lowell with a Westinghouse process that can handle 432 different rolls. Examine your heat treating problems. They, too, may be reduced, clarified, or eliminated entirely.

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H-P-M "400" Die Casters Produce them for *Mall* Tools!

Mall Tool Company reports—"Our three H-P-M Die Casters work 17 hours a day, 5½ days a week and are giving excellent service".

Mall's famous line of portable tools calls for a wide range of die castings . . . many of them complicated castings of intricate design . . . all produced on H-P-M's.

H-P-M's new Model 400-B high speed die casting machine, with built-in nitrogen accumulator, offers injection speeds up to 400 ft. per minute and produces aluminum castings weighing up to 12.2 lbs. Other design features include all-hydraulic die clamp for fast, simple die change-over . . . hydraulic ejectors . . . dual hydro-electric safety devices . . . maximum injection pressure when die is filled . . . and independent handwheel adjustment for both die clamp and injection pressures.

Discuss your die casting problems with an H-P-M engineer and profit from 75 years of specialized experience in the field of hydraulics.

SPECIFICATIONS MODEL 400-B

Size of Die Plates	Space Between Bars	Die Opens	Maximum Die Space	Capacity Per Shot (Lbs.)	Net Wt. (Lbs.)
38"x38"	23"x23"	16"	42"	2.2 to 12.2 (Al)*	40,000

*NOTE: The model 400-B handles brass and magnesium die casting as well. Complete specifications on request.

Write for Catalog 5106, today!

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Lengthens Die Life 100%

STEPS UP PRODUCTION

● The Tool Room of the Rock Falls, Ill., plant of Russel-Burdsall & Ward Bolt and Nut Company had a problem.

Here, dies, made of very tough, high-carbon, high-chrome steel, are bored and reamed for the Heading and Trimming Dept. machines. In this work, the Tool Room was getting a very poor finish, which resulted in short die life. Finally, one year ago, the foreman tried a special Sinclair cutting oil . . .

Results since have been remarkable. The Tool Room states that the dies are now near-perfect, that the necessity for any further finishing operation has been eliminated, and that die life has been increased – conservatively – 100%.

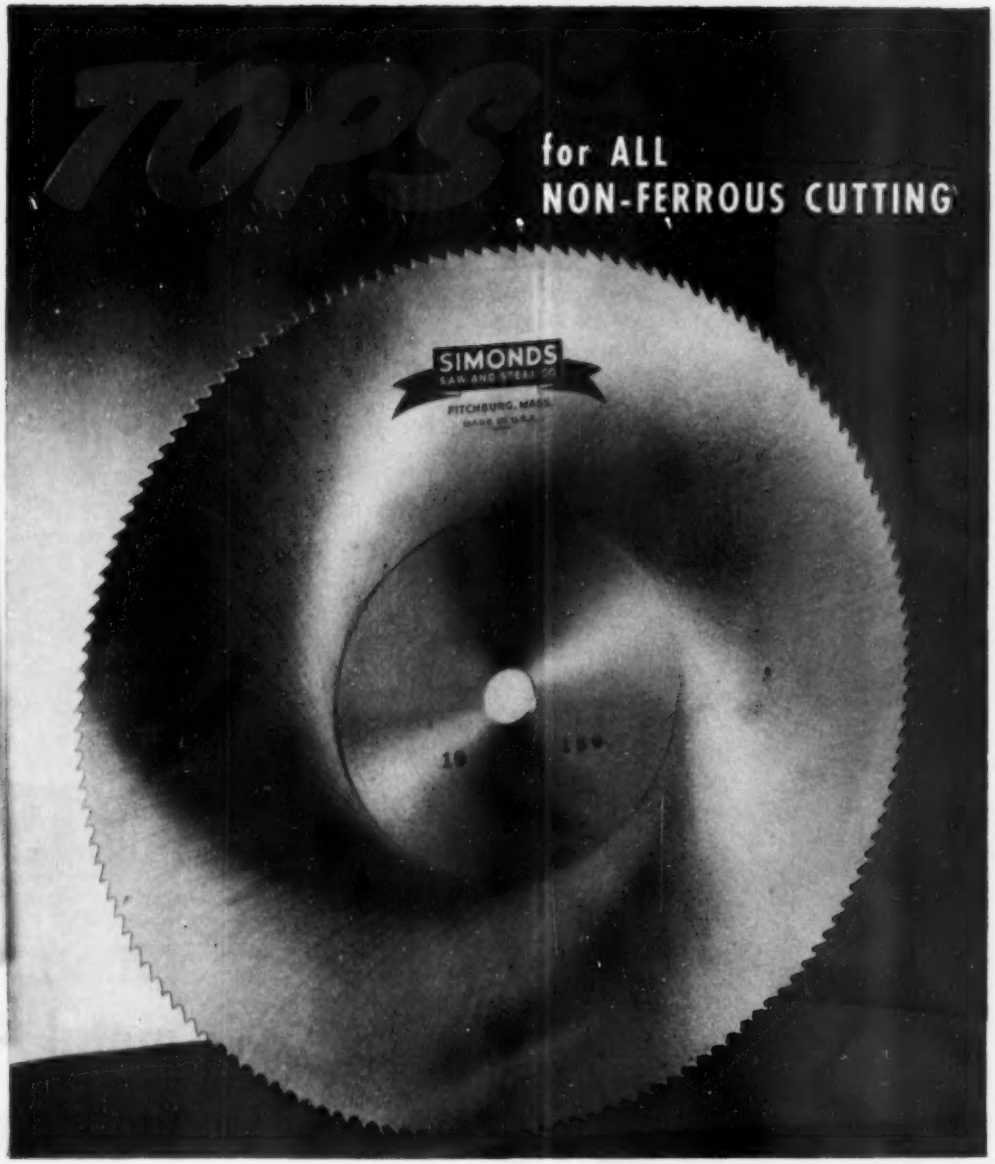
In addition, since the dies now last far longer, there's less downtime for changing dies. Therefore, production of bolts and nuts in this huge plant has been stepped up appreciably.

This is typical of the way the specialized Sinclair Cutting Oils and Coolants are solving machining problems. Perhaps they can help you, too. Phone or write the nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS

for metal working

Tops for ALL NON-FERROUS CUTTING



On all non-ferrous metals, here's the toughest, most "stand-up-and-take-it" saw made . . . with a proven production record on everything from light-wall sections to solids.

SIMONDS heat-treats these saws for individual applications, according to speed, type of material, and machine. And SIMONDS design assures top cutting efficiency . . . with correct tooth-shape that eliminates clogging of gullets . . . with high, smooth finish that resists adherence of chips to plate . . . and with proper clearance for freer, cooler, straighter cutting.

Standard sizes are immediately available from stock . . . so see your Simonds Distributor *today*.

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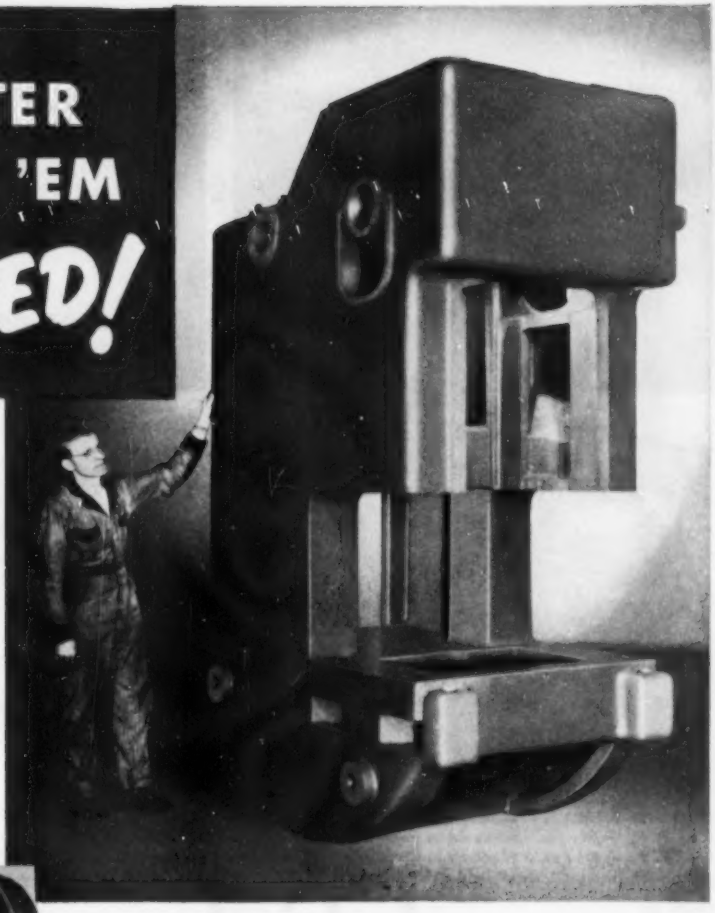
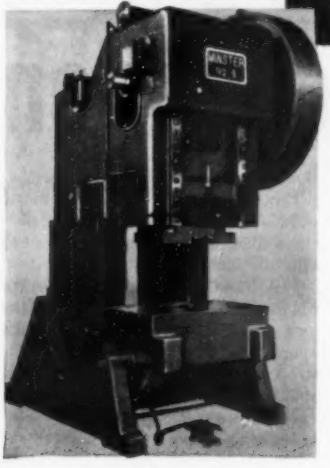


MINSTER NO. 9 open back inclinable press with Minster air-operated combination friction clutch and brake.



LOW DEFLECTION, LOW VIBRATION, SUPER STRENGTH

. . . . you get all 3 with a Minster Press Frame!

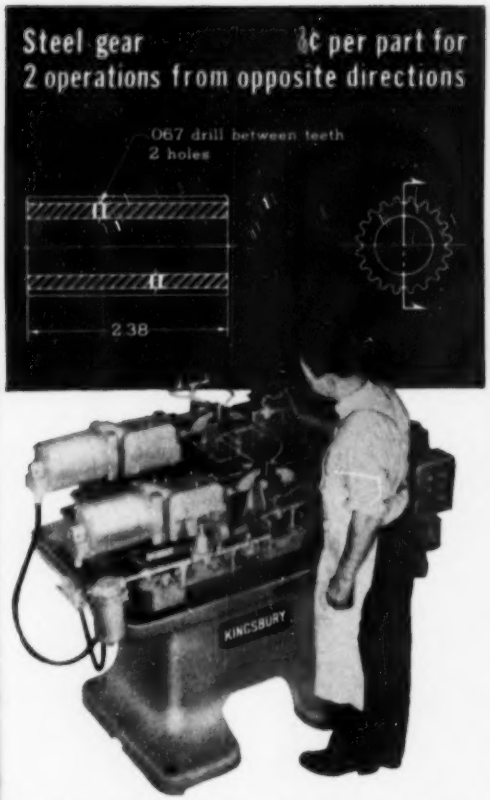
Use of massive cast iron sections is a big, big reason for the extra performance built into Minster presses. Minster frames absorb more shock, more strain, more stress.

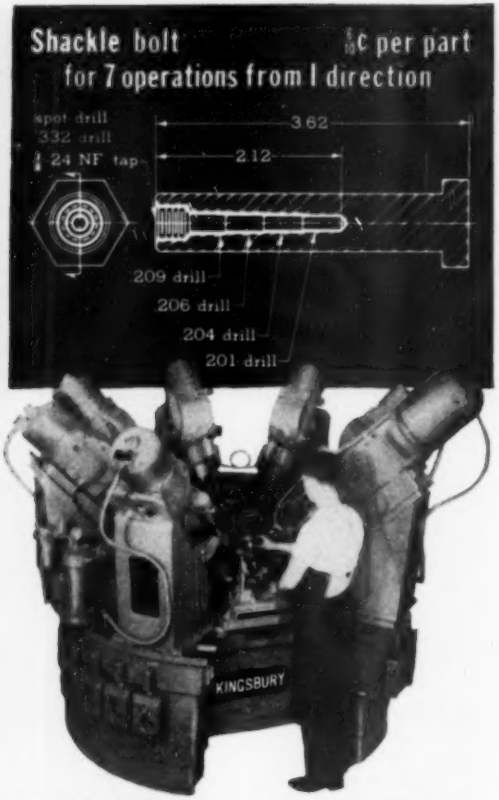
Low deflection, low vibration, less danger of permanent deformation . . . these are advantages that mean greater production, longer die life, and less maintenance.

The obvious rigidity of the No. 9 inclinable frame above is matched by other Minster inclinables and other Minster press types. Keep this rigidity feature in mind the next time you contemplate press purchases.

MINSTER
FIRST IN *Press* DESIGN

THE MINSTER MACHINE COMPANY, MINSTER, OHIO





900 PARTS AN HOUR GROSS. This setup saves money on a simple job. While the man changes parts in one fixture, two units locate and clamp another part, drill the holes and unclamp. He trips levers to start the cycles. Bushings guide all drills.

1000 PARTS AN HOUR GROSS. A 20-inch power index table has eight double fixtures and seven 2-spindle units that work on two parts at the same time. Angular mounting lets coolant flow inside the hole. Clamping and unclamping are automatic.

These 4 high production

Automatic, single-purpose machines save direct labor, handling, space and rejects on simple and complex work

Dear Sir:

Both jobs above are fairly simple. Those at the right are more complex. Some operations are easy, such as drilling the gear. Other operations are tough, such as milling through an arc on the transmission part.

In every case these machines save money because —

— each machine does the work of several general-purpose machines,

— there is almost no scrap.

One machine replaces several

Automatic drilling, milling and tapping units perform the operations shown in one chucking of the work. At the same time, the man changes the work in another fixture. Each machine here does from 1,440 to 9,520 operations per man-hour (80% efficiency). That means savings in direct labor, handling and space.

Empty scrap boxes

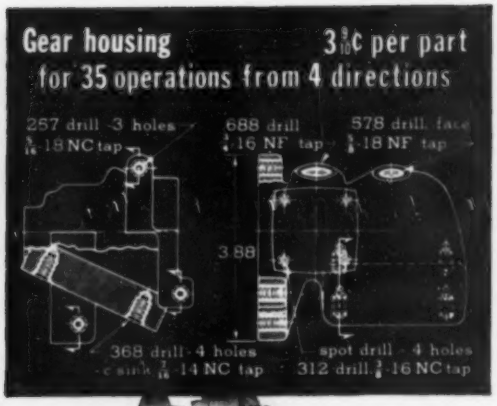
The inspectors won't toss many parts into the scrap boxes.

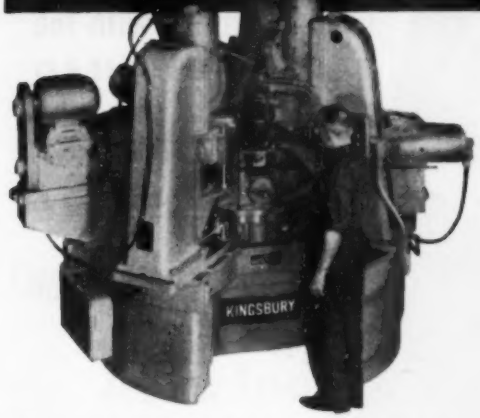
Tools work to close tolerances. We locate spindles to exact indicator readings and use precision bearings. Bushings guide drills and reamers.

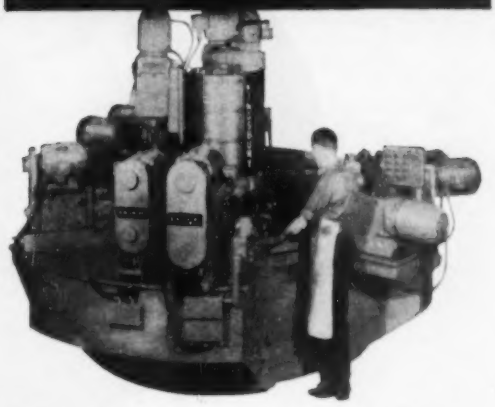
Product is uniform. Automatic work cycles never vary. Each part stays in its fixture undisturbed until after all operations.

Feeds and speeds are correct. We use single-spindle units to obtain the most efficient feed and speed for each operation. For operations of similar size and depth, units may have multi-spindle auxiliary heads.

Machines will do accurate work for years at intensive production. Wear parts are of heat treated alloy steel. Gears are induction-hardened and shaved. Castings and weldments are normalized before machining. Index tables and fixtures are jig bored to minimum toolroom tolerances.







250 PARTS AN HOUR GROSS. This 26-inch indexing machine has ten units — one 15° above the horizontal, four horizontal, one horizontal off the radial line, two vertical and two 25° off the vertical. One milling unit oscillates through an arc of 21°.

340 PARTS AN HOUR GROSS. A 60-inch power index table has 12 fixtures that rotate 90° during indexing. Two vertical units on the central column do three holes on one face. Nine horizontal units work on three faces. Bushings guide 14 tools.

machines cut unit costs

Was our face red

We might as well admit it here, since *This Week Magazine* has already printed it: For twenty years we paid taxes on a house we never built. Some of our customers kidded us, "Never make mistakes, huh?"

How can you be sure?

How can you be sure we won't make mistakes on *your* machine? Well, it's possible. But as soon as it is set up, we test it with your sample parts. You get the samples to approve. If the parts do not meet your specifications, we work on the machine until you are satisfied. It won't take us long.

How can you be sure a Kingsbury will save you money? First ask our Mr. L. A. Carll for a proposal. Send him a print and tell him the operations and hourly output you need. Then compare that cost with your cost now. Find out for yourself using your own figures.

Sincerely,
Kingsbury Machine Tool Corp.
120 Laurel Street, Keene, N. H.

About the costs on the drawings

Each unit cost includes the man and machine on all operations shown – no power or overhead. We assumed three things: 1) 80% efficiency, 2) Each man's wage rate would equal the national average for such work, 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life.

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

Lincoln BULLNECK* FITTINGS

The Only Complete Line of Grease Fittings with the BALL-IN-THE-HEAD

Seals Dirt Out ....Grease In!

CLOG WITH DIRT AND GRIT

THROAT OF ORDINARY

Bullneck* Fittings are Available in the Complete Range of Types and Thread Sizes

Write for Additional Information and Catalog, or Contact Your Nearby Lincoln Sales Office . . .

Look at these Construction Features Found Only in Lincoln Bullneck Fittings... at *NO EXTRA COST!*

1. **Flush Ball Check** — head can be wiped clean without forcing dirt into fitting and into bearing.
2. **Large Grease Passage** — The larger internal diameter permits greater flow of lubricant.
3. **Special Spring Design** — Spring cannot be compressed to restrict flow of the heaviest lubricants.
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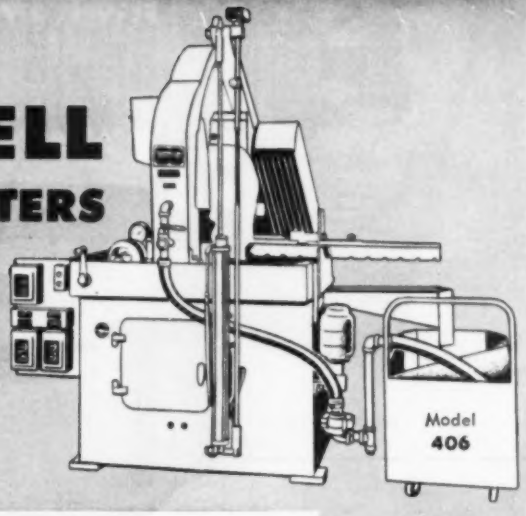
For fast, clean, accurate cutting of hard, soft, round, hex, square, or shaped stock



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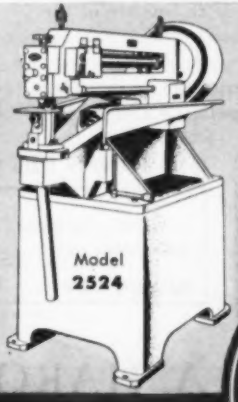
Cut odd shapes from ferrous or non-ferrous shapes



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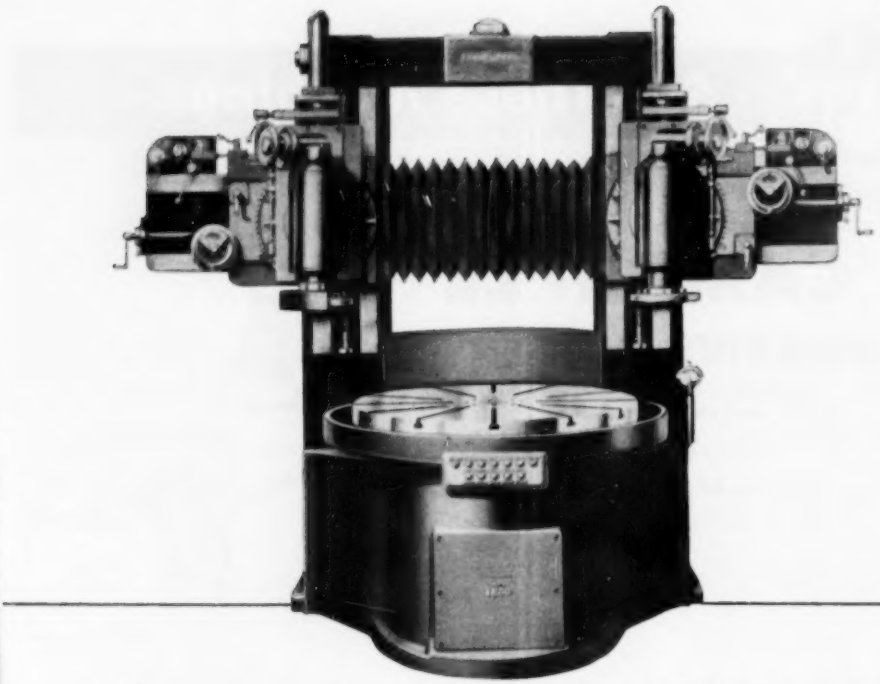

Announcing the new 30" to 48"

FRAUENTHAL MULTIPLE-HEAD CYLINDRICAL SUPER-PRECISION GRINDERS

Here is a welcome addition to the line of big Frauenthal Grinders. It's the new 30" to 48", Series 1800 Grinder . . . smaller brother of the world's largest super-precision 140-inch Frauenthal Grinder . . . ideal for you manufacturers whose grinding requirements can be handled within a maximum 56-inch swing on a 30" to 48" table. This latest Frauenthal Grinder does the same close tolerance grinding of .0002" which made its big 140-inch brother famous. Grinds diameters and parallelism of faces on large precision parts to unusual accuracy of related parts. For uniform precision results on a dependable production basis, investigate Frauenthal Grinders.

Unequalled versatility . . . many unique set-up combinations of Grinding-Spindle positions. The above production photo shows simultaneous grinding of both raceways of big Biangular-type precision roller bearings with Frauenthal Grinder.

IN 10 STANDARD SIZES • ALL SIZES MADE TO ESSENTIAL J. I. C. SPECIFICATIONS

	SERIES 1800				SERIES 2000		SERIES 2200			
TABLE SIZES	30"	36"	42"	48"	60"	72"	100"	120"	130"	140"
MAXIMUM SWING	56"	56"	56"	56"	72"	88"	120"	130"	140"	150"

Ask for Bulletin

A. HAROLD FRAUENTHAL

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- ¶ How to prepare aluminum for painting? *See page 15.*
- ¶ How to clean aluminum before and after heat treating? *See page 20.*
- ¶ How to strip paint from aluminum? *See page 22.*
- ¶ How to clean magnesium? *See page 27.*
- ¶ How to select and install cleaning tanks, rinse tanks and sprays, and spray-washing machines? *See pages 31 to 35.*
- ¶ How to treat water in paint spray booths? *See page 36.*
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Properly machine ground drills give better performance. OLIVER Drill Pointers with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

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No. 510 For Drills ¼" to 3". 2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1, illustrated: — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

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The ACE excels for grinding face mills up to 15" also, slab mills • slitting saws • all types cutters and reamers.

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Efficiently powered by a ¾ h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity, tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools. Offers increased production, lower tool costs and savings in man hours. Extremely fine finish assured.

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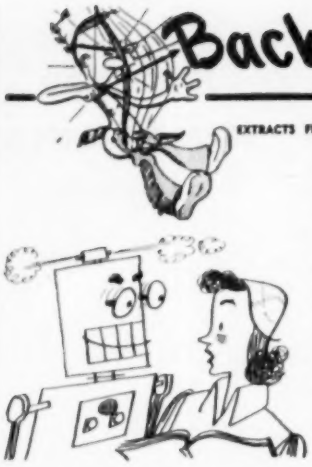
Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS



Man or Robot?

I have read with absorbing interest your editorial "How Soon the Automatic Factory?" (*AM*, Nov 26), because I am interested in promoting the transition from hand- to automatic-operated factories through the medium of electric controls. I am glad to know that the Harvard group believes the process will be pursued further.

But there is one question that bothers me: How are we going to sell back the products of these automatic factories to the automatic machines which made them? In my college studies of economics, I learned that the purpose of work on the part of individuals was to endow those individuals with economic value. In the last analysis, everything is made for the benefit of human beings, and if we successfully automatize human beings out of their economic values, what is the answer?

Are workers being turned into servomotors for menial operations so simple, and yet so inherently complex, that human labor will be cheaper than automatic equipment? Are we taking all the fun of artisanship out of human activity and leaving only coolie types of jobs?

Theoretically, it would be possible to develop an automatic restaurant, but, as yet, waitresses are cheaper and more flexible as servomotors than the equivalent conveyor systems. The Automat restaurants are a weak attempt at automaticity in restaurants, and apparently have not proved too successful. The same comparison could be drawn for other jobs.

I am wondering whether we engineers who devise automatic factories are doing much to improve the dignity of human life.

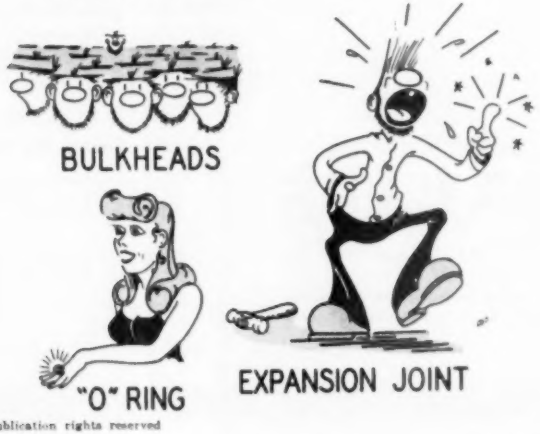
A. H. Fensholt, *President,*
The Fensholt Company

Lost — and Found

In your Aug 20, 1951, issue, you published a letter from A. T. Renson, asking for my present address, and

GRINETICS

BY D. G. SMITH



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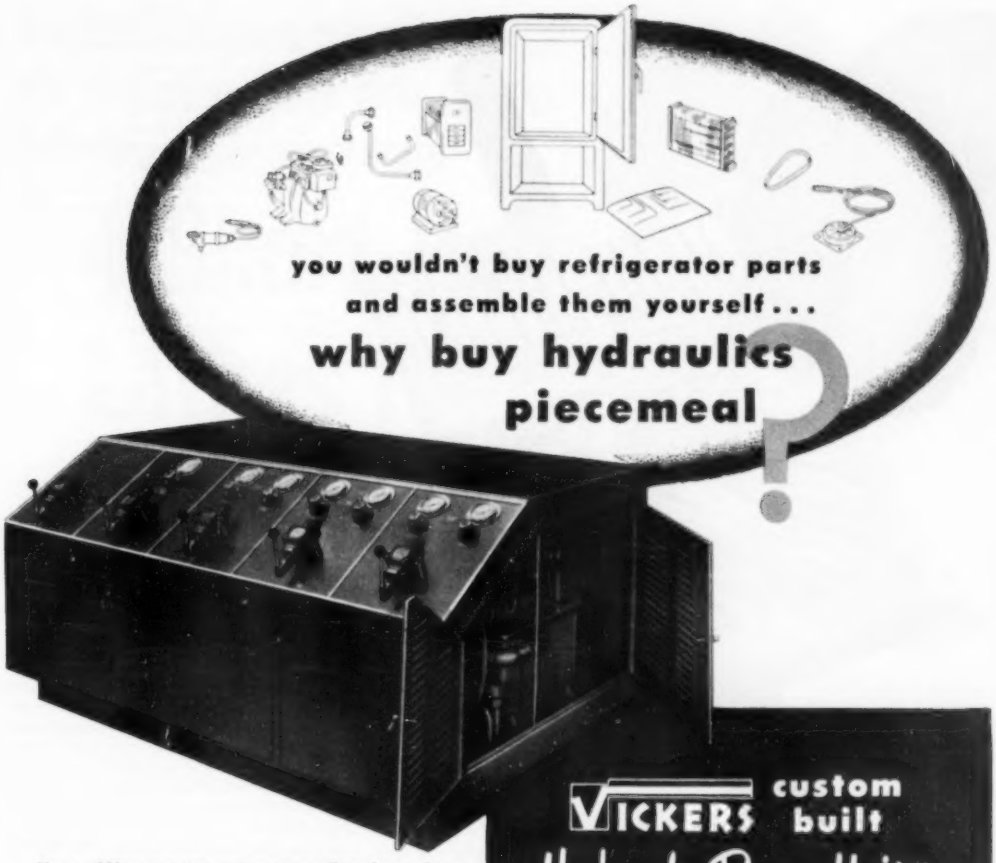

you wouldn't buy refrigerator parts and assemble them yourself . . .

why buy hydraulics piecemeal?

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Hydraulic Power Units

You *could* buy a motor, compressor, coils, valves, tubing and cabinet separately and put them together to make a refrigerator of a sort. But you wouldn't want the trouble and expense, and you wouldn't want to take the responsibility for successful operation. You would rather buy a complete refrigerator . . . get the manufacturer's know-how and have him take undivided responsibility.

Then, why buy hydraulics piecemeal when a Vickers Custom Built Hydraulic Power Unit offers so many more advantages? It is built to meet your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc. are in one self-contained "package". It includes all needed accessories such as oil filters, air cleaners, oil level gauges, fittings, etc. Hydraulic connections are grouped in a conveniently located manifold.

Simplified hydraulic design, improved appearance, and substantial savings in installation and maintenance costs are the result. A most important advantage to both machine builder and his customer is Vickers undivided responsibility for the entire hydraulic system. For further information ask for Catalog 5000.

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expressing his pleasure that you have shown that in Belgium also there are some smart machinists.

Thank you for publishing this letter. It proves that you really do want to help machinists.

Excuse me for being so late in answering your kind invitation, but your magazine is read by so many people in our shop that it sometimes takes as long as two years to make the rounds.

You will see that I have moved from Wavre so will you please give Mr. Renson my new address, so he may write to me, and we can exchange technical ideas.

Thank you for your great kindness in this matter.

Wilmus, Pierre
La Hulpe, Belgium

Encouraging Inefficiency

According to recent reports, the Fairchild Packet is being built at about half the cost-per-pound of other airplanes built by most other builders. This has been brought about by economical planning and production methods which are said to have saved the government — and us taxpayers — over half a million dollars last year.

But because the law limits profits on war contracts to 8%, this saving actually cost the stockholders $40,000 which they might have lawfully received, had this plant not been so efficient. In other words, they were penalized for being efficient, while stockholders of other companies drew larger dividends as a reward for inefficiency. Our boast of encouraging competition and free enterprise sounds a bit hollow when we penalize the plant which has spent good money to make itself highly efficient.

Would it not be more reasonable to consider plant efficiency in setting the rate of profit permitted? Why not set 5% as the limit for plants whose unit costs are higher than the average, and 10% for the most efficient? This puts a premium on efficiency, instead of a penalty, as at present. Those with in-between costs would be assigned profits according to their efficiency.

This would be applying the in-

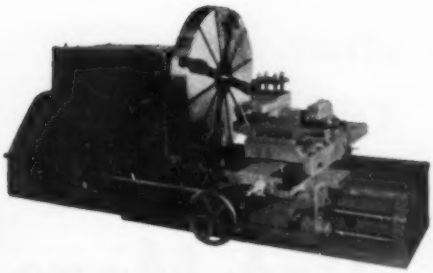
Europe's largest supplier to jet engine makers now offers American manufacturers

4 Short-Bed Lathes for Bulky Work

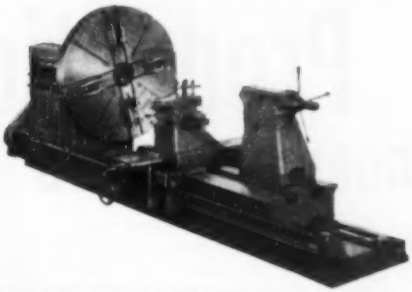
"HEYLIGENSTAEDT" and "T-lathe turning" are synonymous among large metal working plants abroad—and with good reason: This prominent German machine builder has put in more than 15 years researching and refining the designs of its precision lathes to meet the special machining requirements of today's production.

Now there's a Heyligenstaedt model for just about every facing job. Four are shown here—all are scheduled for prompt delivery. Replacement parts will be available at the Kurt Orban Service Center in Cleveland.

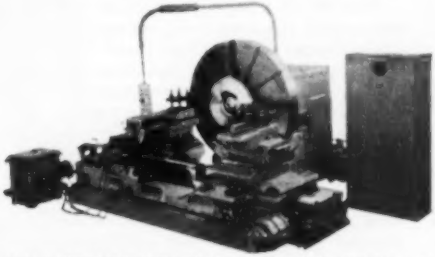
Write for technical literature on the type that best fits your needs.



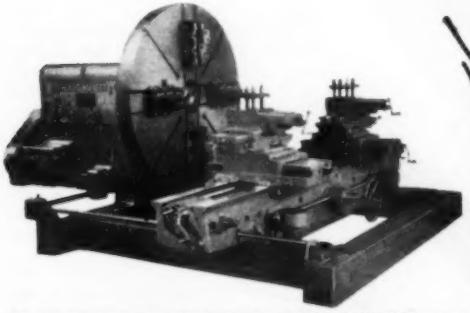
FACING LATHE FOR T-TURNING—Infinitely variable spindle speeds, 1:6 ratio; 3 back gears, power feed in carriage, lower and upper cross slides. Can be had with contour attachment, faceplate gear drive and normal spindle drive. Turning diameter over bed 51"; 67" in gap. *Model 3PB.*



MOVABLE-BED LATHE provides width of gap in front of faceplate from 0 to 19¾". Turning diameter over bed up to 63"; 79" in gap. Lead screw optional—faceplate gear and normal spindle drives available in all machines. *Model 4PBv.*



SECTIONALIZED T-LATHE with hydraulic copying attachment; lead and feed screws electrically synchronized with main spindle. Infinitely variable main spindle speed; with or without contour attachment. Faceplate gear drive and normal spindle drive. *Model 4P.*



FACING LATHE WITH POWER FEED FOR BED MOVEMENT—same basic headstock design as Model 4P. Two compounds; turning diameter in gap 120".

If you are coming to the ASTE SHOW, stop in at Booth No. 1000... see a Heyligenstaedt Lathe in operation.

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Get More Production with GORHAM "M-40-B" Tool Bits!

Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

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"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.

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"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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centive system to profits instead of wages, as in the shop, and would have as good an effect on management as it does on labor. It's time incentives were offered to management to do its job well.

Frank C. Hudson
New York City

What Is Electrolizing?

We have had several letters from readers asking us to explain just what "Electrolizing" is. Not being quite sure ourselves, we asked the president of the Electrolizing Co., and present herewith a brief digest of his reply.—Ed.

Electrolizing is an electrolytic process, utilizing chromium, and binding it to the wear part or tool much better than conventional, hard-chrome or flash-chrome plating, so a degree of fusion or impregnation actually exists. The hardness of the bonded "skin" is 80 to 83 R$_c$; porosity is decidedly less than that of regular chrome; the buildup is very small and uniform; and chipping and peeling is not experienced. The corrosion protection is roughly ten times better than that of standard hard chrome plate.

Details cannot be revealed, as the process is not patented, but we can state that it involves a combination of electrolytic and heat treatments. The coefficient of friction is approximately 1/6 that of untreated, hardened and ground steel, but the surface finish is not affected. The structure of the base metal is not impaired, as the maximum temperature used in the process does not exceed 350F.

The process can be applied to all ferrous and nonferrous metals, except magnesium. The thickness of coating usually runs from 0.00002 to 0.00005 in., as required, and is completely uniform, even at the roots and crests of threads. It does not take the place of heat treatment, and a hardened foundation is advisable for the best wearing surface.

David B. Grant, Pres.
The Electrolizing Co.

This Tiny Tap Tells a Big Turning Story

This tiny part portrays better than words the extreme accuracy you can expect from a Monarch 10" Model EE Precision Toolmaker's Lathe. The operation detailed below was actually performed on a standard lathe which is employed primarily to turn a variety of parts for small, precision, automatic tapping and drilling machines for the user's own manufacturing operations. These master taps which he chases occasionally are needed to make a master die. This, in turn, is used to produce working taps in quantity. End use is tapping a hole in the end of surgical needles to permit holding of the suture.

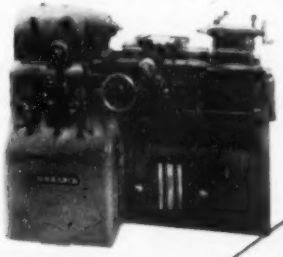
How surgeons thread the needles, we'll never know. We do know that in all probability you'll never have to work as fine as 200 threads per inch. But accuracy like this can be just as important to you, regardless. With the Monarch 10" Model EE, as a look at the listed features will at once reveal, you get a machine unequaled for precision, speed and sensitivity. Like most of the Monarch line of lathes, it can be furnished with "Air-Gage Tracer" controls . . .

The Monarch Machine Tool Company, Sidney, Ohio.

Surgical needle master tap—overall length, ¾"—diameter, .0218"—threads per inch, 200—thread accuracy, lead within .0001 over the entire threaded length of ⅜".

**MONARCH 10"
MODEL EE FEATURES**

- All electric drive direct to spindle through multiple "V" belts. No gears in headstock.
- A true high speed lathe for small work. Available with speed range up to 40 to 4000 R.P.M.
- Totally enclosed, automatically lubricated end gearing and gear box.
- Flame hardened and ground ways for both carriage and tailstock. Bed all in one piece—no inserts.
- American standard Camlock spindle nose—for quick, rigid and accurate chuck and fixture mounting.
- Easy, fatigue-free operation. Base design permits operator to work close comfortably. He gets production—not backaches.
- Over 6000 10" Model EE machines in use.
- The only small lathe available with anti-friction bearing taper attachment.
- For thread chasing up to 100% faster, has exclusive combination of electric lead-screw reverse and variable reverse speed control.



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THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen:
Please send me without obligation your complete illustrated Booklet #302, covering the 10" Model EE Monarch Sensitive Precision Toolmaker's Lathe.

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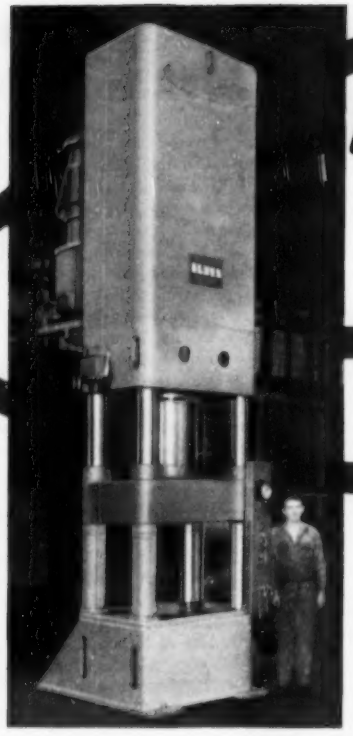
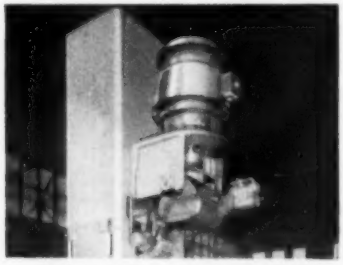


Elmes Pipeless Press designed for use in hot or cold nosing of artillery projectiles. Note complete absence of conventional high-pressure piping in main hydraulic circuit.



Rear view of upper section of above press, showing Pipeless Pumping Unit. The only pipes on entire press are pilot lines, pressure gauge line, and drain lines. Of these, only the pressure gauge line carries high-pressure fluid.

Munitions Manufacturer Scores "DIRECT HIT" ON MAINTENANCE COSTS!

...with *Elmes* PIPELESS Hydraulic Presses

Shown here is one of a group of Elmes Pipeless Hydraulic Presses recently installed in the plant of a large munitions manufacturer. These revolutionary new-type presses will be used in the production of artillery projectiles.

High production and virtual elimination of downtime are assured by the Elmes Pipeless design which *puts an end to high-pressure piping troubles.*

The main hydraulic circuit in this new-type press has *no piping.* All high-pressure fluid is conducted through short, direct passages drilled in the structural parts. There are no high-pressure screwed joints to loosen, no oil dripping from loosened pipe or fittings, no welded joints to break.

Now you can get the superior advantages of Elmes hydraulic power—speed, accuracy, instant response, smooth operation—*plus* matchless economies of the Pipeless principle, *all at no premium.*

Any type of Elmes Hydraulic Metal-Working Press can be supplied with the new Pipeless construction. Get the facts on this outstanding Elmes development now!

WRITE FOR PIPELESS PRESS BULLETIN 1011

Fully illustrates and describes in detail the production-increasing, cost-reducing features of these revolutionary new-type metal-working presses.

American Steel Foundries

ELMES ENGINEERING DIVISION

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SPOT NEWS of Metalworking

- **There is much fretting in certain circles** over the long time it is taking to modify the design of the British Sapphire jet engine so as to make production of it practical on a mass basis in this country. Those who are taking jabs at the Air Force emphasize that it passed up a chance to choose the relatively simple Avon (Rolls Royce) engine in favor of the complicated Sapphire. British are putting their hopes on the Avon.

- **Union shop issue will be decided in several cases at one time** by Wage Stabilization Board. U.S. Steel, Douglas Aircraft and perhaps Boeing are involved, with a decision likely in favor of the unions. This way, several union leaders and CIO and AFL can share credit.

- **Demand for engineers, technicians and highly-skilled craftsmen** is just as great as before stretchout of aircraft schedules was announced, Aircraft Industries Association reports. Aircraft employment, now 600,000, should be 750,000 by year's end. Wartime peak: 2 million.

Renegotiation ground rules won't be final until after April 1. Renegotiation Board is revising regulations it proposed to industry in January. New rules will be tailored for individual industries. Efficient defense contractors will be given every break.

- **Three Cleveland metalworking firms will have chance to present their case** for deferment of workers to local draft boards at series of meetings, first of which is on March 19 at plant of Modern Pattern Co. Second meeting will be with machine-tool builder, and third with a tool and die shop. Each meeting will acquaint draft board members with essentiality of individual company and its industry. County board is sponsoring the plan.

- **More emphasis on big bombers** is likely to be result of moving in General Curtis Lemay as second-in-command of Air Force. Army and Navy brass are unhappy because tactical aviation will be given less attention.

- **Extension of length of draft service** is believed probable as result of death of UMT. Pentagon wants a three-year minimum service instead of the present two-year service. Congress also will be asked to make draftees serve in reserves following active duty.

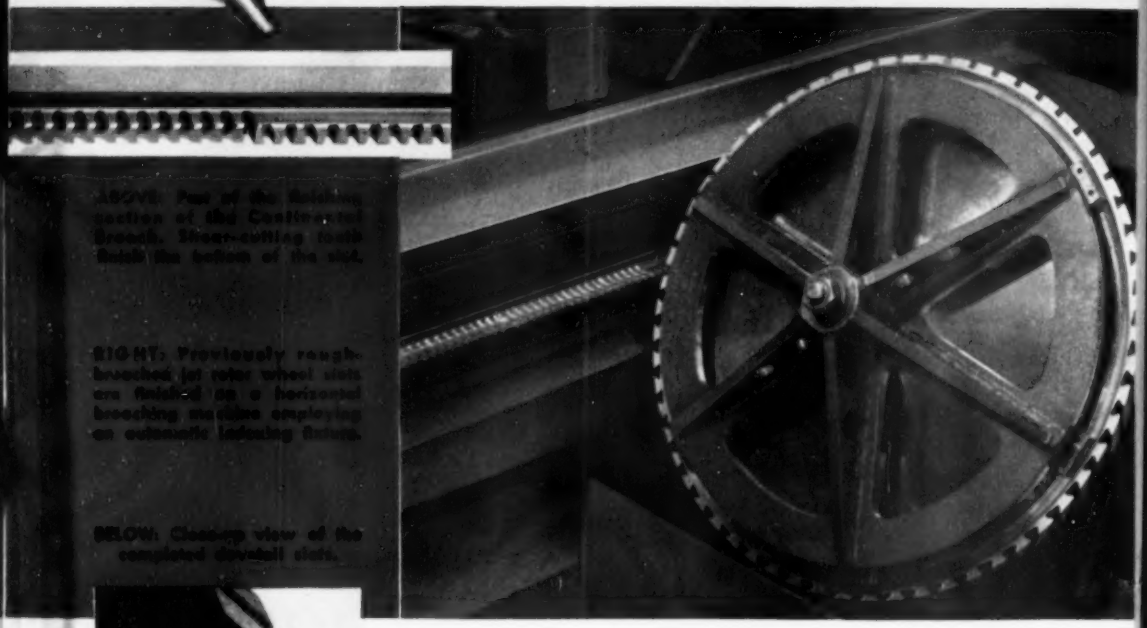
- **Advance deliveries of steel** have reached the point with at least a few companies that they have notifed mills that they will not accept tonnages shipped more than 15 days ahead of the requested date. Deliveries, for one thing, are upsetting their legal stockpile allowances.

An "Expediting List" of defense items demanding immediate attention because they threaten to become a bottleneck unless something is done about them right away, is being proposed for use by defense contractors and machine tool builders. It would rank ahead of the master preference list. Washington would hope to avoid serious future trouble by putting into force such a list with overriding priority compared with any other list.

- **Order for over $1 million of U.S. machine tools has been placed** with Machine Affiliates, New York, to rehabilitate Mexican railway shops, with deliveries dependent upon granting of necessary priorities. Mexican government is working in Washington on the ratings.

- **Bar forgings of titanium alloy,** with excellent surface finish, are being made in quantities by Kropp Forge Co., Chicago, for jet engine parts and industrial uses. Difficulties encountered are similar to those in forging stainless steel (metal is "stiff" and its abrasive action accelerates die wear). Kropp is producing shaped rings, blanks and bars of titanium in open dies.

JET ROTOR WHEELS SLOTTED BY CONTINENTAL BROACHES



ABOVE: Part of the finishing section of the Continental Broach. Shear-cutting teeth finish the bottom of the slot.

RIGHT: Previously rough-broached jet rotor wheel slots are finished on a horizontal broaching machine employing an automatic indexing fixture.

BELOW: Close-up view of the completed dovetail slots.

CONTINENTAL BROACHES TAKE HEAVY CUTS TO MINIMIZE WORK HARDENING

The heat-resistant stainless steels used in jet aircraft engines present a special machining problem because of their toughness and work-hardening tendencies. The solution is a rigid setup, ample power and properly-designed tools.

Shown here is a typical application of a Continental Broach cutting accurate, uniform dovetail slots in a jet rotor wheel. The broach is designed to take substantial cuts to minimize work hardening. These slots are cut in two operations, although some shops prefer to complete each slot in a single pass.

For the most efficient broaches to work with your broaching equipment contact your local Ex-Cell-O field engineer, or write the Continental Division of Ex-Cell-O.

CTW

31-4

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Washington

Mobilization is up in the air again. The top government planners are divided. Some want the President to stick by his recent cutback of military spending. Others say we must speed up arms output to avert a looming business recession.

• • •

Recession talk comes chiefly from government economists. But they are getting their ammunition from production experts. Production men point out that steel demand has fallen behind capacity to produce, predict the same thing will happen soon to aluminum.

That's why the end of CMP is being urged. High controls officials see metals supplies easing already, measure that against estimates of dwindling military demands. They think that makes tight materials controls unnecessary by early next year.

• • •

Take the steel situation, for example. Direct defense needs will take about 14.5-million tons this year. These demands will drop below 12-million tons in 1953, to just a little over half that in 1954, even less in 1955.

But productive capacity is soaring. It will rise from some 107-million ingot tons to around 114 million this year, from 78-million product tons to about 85-million. It's due to rise almost as much again in 1953.

• • •

Now non-military demand is drying up, too. You can see that in requests for second-quarter, third-quarter CMP allotments. Many big users are asking less than they did for the first quarter, though normally they'd want seasonal increases in materials.

There are two possible explanations. Controls experts say industry has stocked 7-8 million tons of steel since Korea, now is working off this supply. Allotment requests will go up when inventories are better balanced.

The economists disagree. They think production of consumer goods may go down—because of buyer resistance. Anyhow, reduction of metals inventories means manufacturers are pressed for cash, and that's just as bad, they say.

• • •

And steel makers worry about idle capacity, tell Washington they have some now for: straight chrome steel (which has been decontrolled); tin and terne plate; cold-rolled strip. Only heavy structurals and plate, bars, seamless tubes are still critically short. Even these will be in good supply by next year, they say.

• • •

Aluminum is heading the same way. It's still tight, but that's artificial. Supply actually is sufficient for current demand. But orders have been backlogging since late last year. That's because DPA gave out allotments exceeding supply, has been trying to catch up ever since. But even this backlog will be worked off in the April-June quarter.

• • •

Aluminum supply is going up, too. We're getting 15% more than in 1950 now, will have 35% more by year's end. Some of the increase is coming from new productions, some from imports.

Military demand already is tapering off. How much isn't certain yet. But you get an idea from the 30-million lb the Defense Dept. has returned out of its second-quarter CMP allotments—the allotments were made before the arms program was cut back. The 30-million lb amounted to about 10% of the total of original allotments for arms.

• • •

Copper will remain tight—there's no question about that. But the mobilization cutback will help on that, too. At least to the extent of making copper available for some more urgent civilian requirements. The services have returned nearly 20-million lb of brass and 5-million lb of foundry copper—about 8% of their second-quarter copper allotments.

• • •

Civilian producers will get more metal out of the supplies turned back by the military. The auto industry will get a big boost, partly to ease Detroit's unemployment headaches.

Look for auto output to hit over 4-million cars this year. The auto makers have talked DPA into raising their second-quarter quota from 930,000 to 1-million-plus. That's about what they'll turn out in January-March. And they will do better in third and fourth quarters.

• • •

Job-hopping and pirating of engineers, caused by the shortage, is under investigation by the Office of Salary Stabilization. Engineering firms are being asked to report their hiring and compensation practices. Later, a similar survey will be made among industrial firms employing engineers.

• • •

Taft-Hartley—as Taft conceives the law—has lost what little real backing it had in the National Labor Relations Board. Truman picked Ivar H. Peterson to fill James J. Reynolds, Jr.'s, place. **Reynolds,** who resigned, was a "lone dissenter" supporting management views on most issues. Peterson has been aide to Sen. Morse, outspoken critic of the labor law.

Tandem bearings made

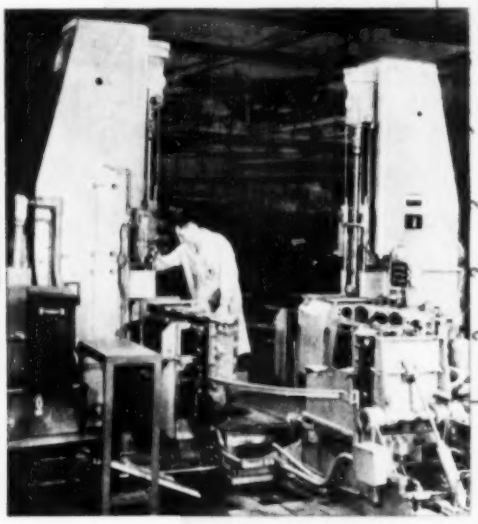
ROUND • STRAIGHT • IN LINE

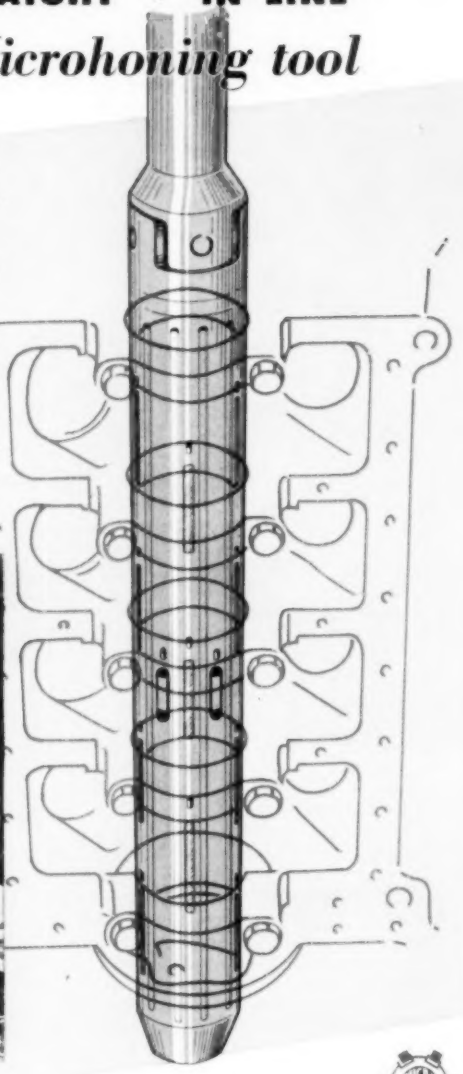
with NEW Microhoning tool

ALL FIVE bearings in V-8 cylinder block MICROHONED within .0005" for diametric size, roundness, straightness and alignment.

Plastic guides stabilize tool and control cutting. One bank of abrasives MICROHONE all bores.

This double column Model 740 machine equipped with new guided type MICROMOLD tools MICROHONES Main Bearings in 60 blocks per hour, removing approximately .002" stock from the diameter of each bearing. The blocks are automatically taken from the line, conveyed to either of the columns, and MICROHONED. The operator makes occasional spot checks as the blocks leave the machine.





Write for Cross Hatch for complete story on MICROHONING Interrupted Surfaces.

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Detroit

Automobile companies have due warning of their next labor crisis. It can be expected in 1955, when the major long-term contracts now existing run out. The ground of argument will be annual wages.

• • •

CIO's auto workers have a committee on the job covering the subject, developing a formula which will be made public late this year. No conclusions have been reached yet, but this seems to be the way things may shape up:

A guaranteed work year of 50 weeks a year will be sought at the employe's regular wage. To qualify for the guarantee, a man would have had to work a specified term—some members of the committee believe the ordinary probationary period is enough; others think the guarantee should be confined to 1-year men; others feel the term should be for 3-year men.

No overtime would be paid for any work beyond 40 hours a week, until the 2000 hours of the guarantee are covered. Thereafter, all overtime would be at premium rates.

• • •

The 1952 Ambassador and Statesman golden anniversary models of Nash Motors bring to American production automobiles for the first time a foreign styling touch. Pinin Farina of Italy did the entire design job on the new cars. (Tooling and die changes for its new models, incidentally, cost Nash $16 million.)

Farina does his design job a little differently than most. He works directly in sheet metal on a wood skeleton. Usual full-scale models of clay and plaster are dispensed with, as well as mahogany mockups.

• • •

New tooling, both military and civilian, continues to filter into the shops which make a specialty of automotive work.

Expected for release before too long is a new Ford truck program. Chrysler, also, is talking about some plans for the near future.

Beyond that, the trade anticipates some kind of developments before long out of Chevrolet at Flint. Chevrolet stopped work recently on some tooling for 1953 models, reportedly because the 1952 Fords had involved enough of a change that the plans at Flint were deemed insufficient to meet the challenge. Accordingly, Chevrolet expects to produce some new ideas.

• • •

A fire which burned out more than 350,000 sq ft of Ford Motor Co.'s uncompleted tank plant in Livonia, Mich., early in March, may not cripple production schedules, Ford officials say.

The giant plant, under construction since last April, was to be completed early next year. John Dykstra, Ford vice-president, said that if sufficient replacement of steel and machinery can be obtained, schedules will be met. When completed, the 1.6-million sq ft building will produce about $195-million worth of medium tanks.

A few machine tools were destroyed, but the bulk of those to be used in the plant were still in storage at Oak Ridge, Tenn. Damage exceeded $1 million.

• • •

The truck industry is casting highly interested eyes at the liquid petroleum gas-driven vehicles used extensively already on the west coast and the southwest.

International Harvester and Reo have already announced l.p.g. trucks specifically designed for propane-butane mixtures. Others will probably not be far behind.

L.P.G. trucks operate on fuel that costs about 5¢ a gallon cheaper, and on the basis of an average 5 mpg, that spells out to a cent-a-mile savings. In addition, overhaul cycles are vastly lengthened, oil changes are reduced, engine life is lengthened, and a more even performance is achieved—or so say the proponents of the l.p.g. engines.

• • •

Modification of gasoline engines for l.p.g. use is not difficult; the one major exterior change requiring tooling is a new intake riser and exhaust manifold. New foundry molds, of course, are required.

Pistons are redesigned; cylinder head is revised modestly; and exhaust valves, guides, and inserts are also redesigned.

Reo, building 200 gasoline engines a day now, expects to build 35 to 45 of the new l.p.g. truck series before long.

• • •

Are you finding drawing metal brittle, hard to draw on that account? Try a Fisher finding: Run the steel through some bending rolls, then straighten it out again. The exercise of the metal seems to soften it for an hour or two, simplifying stamping problems.

• • •

A change in voltage specifications, long discussed in the auto industry, may come about out of current efforts to conserve copper. Some engineers are studying 12-volt ignition systems rather than the present 6-volt specifications.

Advantages: considerable reduction of copper required in generators, starters, voltage regulators, all other wiring.

Problem: sturdier requirements for lamps. By-product advantage: more intense spark action, which would improve engine performance.

. . . delivers high production-low cost carbide planing!

Here's high production — low cost carbide planing at the Beloit Iron Works, Beloit, Wis. This GRAY OPENSIDE PLANER CUB is running 300' per minute, day in — day out, carbide planing packing strip holders for suction rolls of paper making machinery.

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Machine Tools

Machine-tool production is not far from a level of $100 million a month.

It is not likely, however, to go much higher than that, if any.

For the truth is that production sights have been lowered a bit. The talk about a $1.5 billion-a-year rate has disappeared.

The Air Force (and British) cancellations have jolted Washington as well as machine-tool builders. It is impossible any more to pound the desk and demand further sharp expansion of output and of productive facilities.

• • •

It would be a grave error, on the other hand, to jump to the conclusion that the defense tooling program is anywhere near being "over the hump."

Reliable authorities predict that, even after the cancellations have been washed out, defense demands should keep machine-tool production up around $1 billion a year through 1953 as well as this year.

Distribution of this whopping business, however, will be very uneven. And plenty of builders will be looking for orders long before the current year is out.

• • •

The Navy, thus far in the background, is reported to have a program for buying almost 50,000 machine tools. Army Ordnance Corps also is believed to have sizable purchases in prospect.

The Air Force continues to be the major uncertain factor in the situation. It doesn't know what it wants. And no one is sure when it will make up its mind and how big its program will be.

Point is that the armed services have plenty of money with which to buy machine tools. Civilian agencies now are trying to find out how much of this money the services expect to spend.

Best current estimate of the dollar volume of defense machine-tool buying in calendar 1952 is $1 billion.

• • •

One of Pentagon's explanations for cutting back jet-engine programs is that the base was too broad to begin with. There were too many jet programs. And five subcontractors were being set up to do what two could do just as well.

The British program, like our own, was too ambitious and had to be shaken down onto a realistic basis. As the British surveyed more carefully their needs, certain machine-tool orders inevitably were washed out.

• • •

There is slight chance just now for a modification of the order prohibiting deliveries of unrated machine tools. The thinking is that no such deliveries should be permitted this year.

Washington recognizes, on the other hand, the plight of certain companies, especially in the press field. The products of these firms have little application to defense items.

Just what can be done to relieve the situation in which these companies find themselves, remains to be determined.

• • •

German machine-tool builders are launching an intensive campaign to secure a slice of the U.S. and Canadian markets.

One group of 24 companies is sending representatives to the International Trade Fair at Toronto this spring. It is hopeful of setting up adequate sales outlets both in Canada and in this country.

A second group of 12 companies, called the MSO group, is to be here for the same purposes as the first group. It will have displays in Chicago at the time of the ASTE Show and will exhibit at Toronto too. Mr. Zubach is director of the MSO group.

The German firms of VDF and Boehringer also have representatives en route here to make a survey of the U.S. machine-tool market.

• • •

The over-all North American campaign to sell German machine tools is being organized by the German American Trade Promotion Co. of Frankfurt. Dr. Schaller is the head.

Germans claim that they intend to station specialists over here to get their machines into operation in customer's plants. They likewise say that adequate service parts will be stocked.

It is said that prices of German machines are not uniform in various foreign markets. They vary according to competitive conditions in a particular country.

• • •

The report is that the German government will reimburse German builders for 40% of their promotional costs at expositions in this country and elsewhere.

That is the same device that the British used two years ago when the Labor government agreed to pay a healthy portion of builders' bills for showing machines at the Toronto exposition.

• • •

The Joint Chiefs of Staff still are reluctant to okay a master preference list of defense tooling jobs of highest urgency. Munitions Board and NPA have prepared such a list, which is said to contain top 13 programs.

"Expediting list" of defense items which threaten to become bottlenecks may be created. If so, it will outrank the master preference list.

Why not get more carbide

It's easy to get spectacular Carboloy Cemented Carbide performance in a wider range of blanking, drawing, forming and piercing dies with up-to-the-minute Carboloy helps for carbide applications, die designs.

FIELD ENGINEERING—At your call, a Carboloy Field Engineer will drop around to your plant . . . ready with on-the-spot answers to your press die problems. Call him. He's a carbide expert who will advise you on proper application of carbides to your press dies.

Do you manufacture or use press dies? Simple or complex, for any blanking, drawing, forming or piercing operation?

Why not explore the full possibility of applying Carboloy Cemented Carbides to those dies . . . and get increased production, less downtime and maintenance, fewer rejects, longer die life and all the other benefits that *only* carbides can give you?

Complete Carboloy Die Services, available *free*, can help you make the design and application of carbides to your dies an easy job. And high-quality Carboloy Cemented Carbide is just the metal you'll need to do the job right.

Check the services outlined on these pages. Then contact a Carboloy representative first chance you get, or mail coupon.

DIE TRAINING SCHOOL—Here is practical carbide training your tool room employees won't want to miss. Tuition-free. Features specialized courses in the finishing and servicing of carbide dies to increase die life, assure top performance. Located in Detroit.

TECHNICAL DATA—Free, all-inclusive technical literature is another Carboloy Die Service. The Die Engineering Manual, shown here, can be a handy guide to help you design, apply, use and maintain carbide dies. Send coupon for your copy right away.

Visit the Carboloy Exhibit Booth No. 539 at the A.S.T.E. CONVENTION Chicago, March 17-21

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

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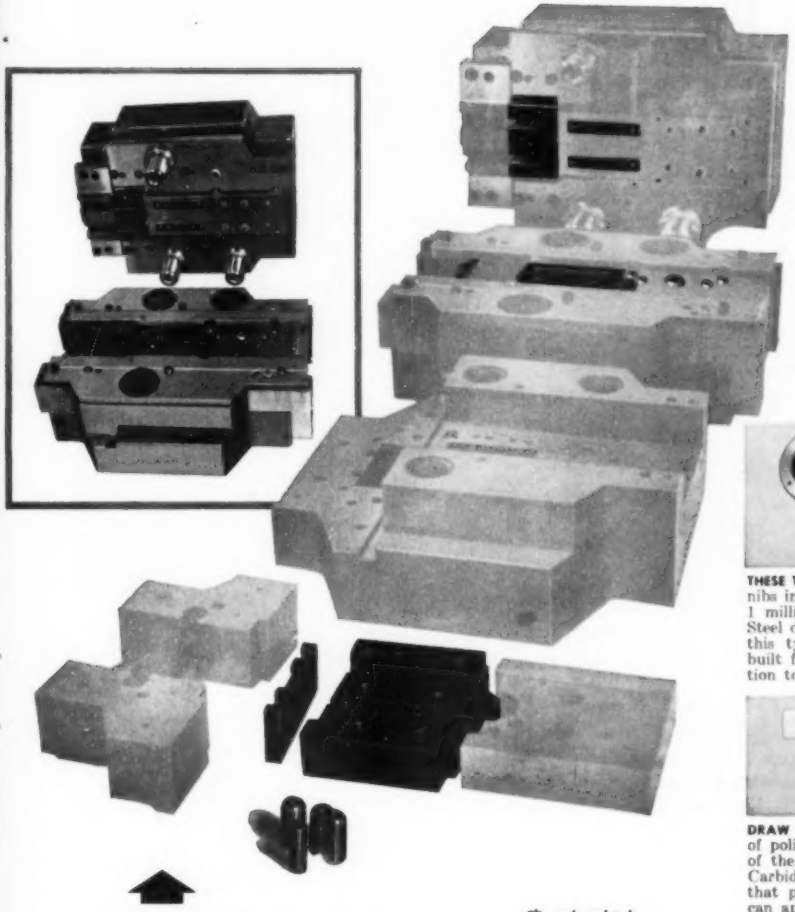
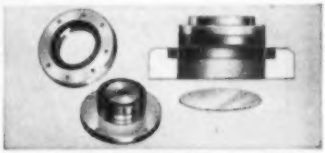
benefits from your press dies?

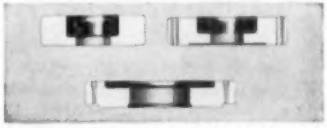


LAMINATION DIE complete with guided, spring-type stripper is an example of the more complex dies where Carboloy Cemented Carbides can be easily applied. The parts illustrated above in black are applications of Carboloy Cemented Carbide, located at the spots where wear would occur quickly if carbides were not used. The carbide parts used here will wear up to 20 times as long as tool-steel. They are finished to fit in everyday tool-room fashion by using correct type of grinding wheels. Carboloy engineers will be glad to help you design and apply carbide to every possible die of this type.

COMPACTING DIE and punches for piercing highly abrasive materials are other examples of the types of carbide dies widely used throughout industry. The uniform, high-quality Carboloy Cemented Carbide in these and other dies for almost any production job will boost production, lower costs, and bring you bigger profits wherever used.



THESE TYPICAL blanking dies with Carboloy nibs in the die and punch produce up to 1 million circular laminations per grind. Steel dies did only 50,000. Simple dies of this type can be readily designed and built for you by the Carboloy organization to your specifications.



DRAW DIES. Better finishes, elimination of polishing and longer die life are some of the benefits that Carboloy Cemented Carbides provide in these drawing dies that produce stainless kitchenware. You can apply carbide like this right in your own tool room, or have it done at the Carboloy plant.

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☐ **Die Engineering Manual D-124**

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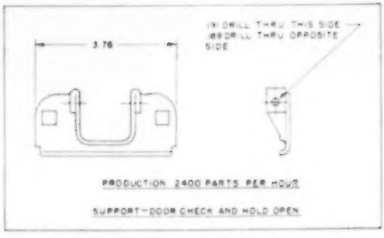
The parts are gravity fed down the chute to the drilling position.

Fixture—At the drilling position they are clamped automatically by an air cylinder which clamps the part on the forward stroke. The cylinder is arranged with a small ejector finger which automatically ejects part which passes into a chute in rear of machine. All clamping pressure is transmitted to the ears with final location in the square holes.



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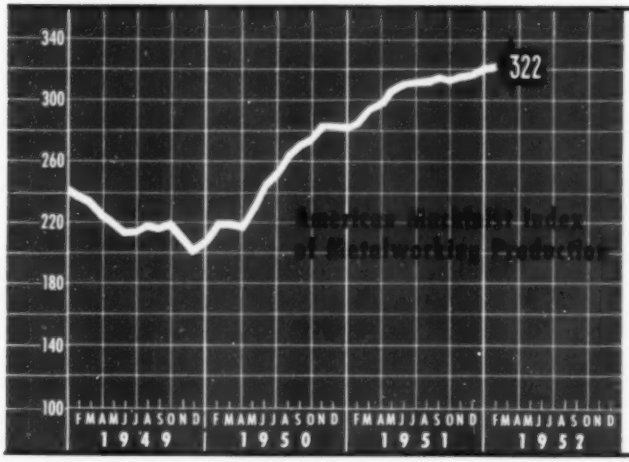
Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	FEB '52	JAN '52 (p)	DEC '51	FEB '51
	322*	321p	318r	288
Machinery	322	320		285
Electrical Manufacturing	365	362		327
Automobiles Trucks	219	219		241
Transportation Equipment	493	487		313
Other Metalworking	315	316		300

* Estimated (p) Preliminary (r) Revised

Metalworking may move out sideways on a high plateau, rather than go up farther, the next few months.

It is in no danger of moving downward. Expanding defense work will prevent that, taking up slack which may appear elsewhere.

But the big push upward seems to have spent itself for the time being.

• • •

It's an old story to say that defense is going at a snail's pace, compared with what was anticipated. But that fact, plus the stretchout of the proposed program, suddenly has eased materials surprisingly.

Second and third quarter allocations will be more than expected. And the problem shifts then from ability to get materials to ability to induce consumers to buy goods.

The automotive situation illustrates the change in tune. DPA had guessed that it could allow critical materials for only 800,000 automobiles in the second quarter. The decision now is to earmark materials for 1,050,000.

• • •

Many metalworking companies are bothered by high inventories. They are putting on drives to slash them substantially.

One reason seldom mentioned: excess profits tax is cutting into working capital. Companies need cash to finance necessary expansions and plant rearrangements.

• • •

Here is a quick run-down of the materials situation: Steel is easing so rapidly that NPA plans to decontrol some products later this year.

Cold-rolled sheets are likely to be first out from under. Still in tight supply are heavy plate, bars, wide-flange structurals, galvanized sheet, most alloys.

Straight chrome stainless continues in good supply.

• • •

Copper will be in easy supply within six months, insist former copper industry men in top mobilization jobs. The same thing will happen to copper that has occurred in lead and zinc.

Official Washington line is to stress continued copper shortages. Mobilizers could ease the copper situation by paying the Chilean government what it wants.

Actual allocations of copper to U.S. industry remain low: 106,500 tons for March, compared with 106,800 tons in February and 120,000 tons in January.

Aluminum allocations have been scaled down slightly below the capacity of mills. A 3-4% increase in allotments could put aluminum again in short supply.

Washington looks upon aluminum as basically still in a tight spot and as likely to stay there. Hence defense officials are studying the possibility of another round of expansion and of purchase of additional aluminum in Canada.

• • •

Screw machine products industry's backlog has gone off from 18 weeks to 14.

Stamping industry is gradually working itself out of the doldrums. Here is what January shows: **25% of shipments** went to automotive customers, 27% to military, 48% to all others. In same month, 41% of new orders were from military, 17% from automotive, 42% from all others.

Gaging Business

Almost all the business barometers (except for Metalworking) show that things are off.

Take the number of production workers in manufacturing. They were down in January compared with a year ago.

Only nine major industry classifications out of 21 showed gains over the like month in 1951. Six of the nine are durable-goods industries.

• • •

The average work-week is down a trifle, from 41.2 hr to 40.7 hr. That means that average weekly earnings of factory workers are off. It's only down 57 cents, however.

Makers of consumer goods and of building materials are mainly responsible for the declining work-week.

• • •

Prices, too, are easing. Wholesale price index of all commodities, on new base of Bureau of Labor Statistics (1947-1949 = 100), continued to decline in January.

Peak came (116.5) in February and March of last year.

Industrial prices, as measured by all commodities other than farm products and foods, is 14.3% above the base period. It also is 2.3% below last spring's high point.

Cost-of-living will continue its downward trend the next few months. It may decline enough to jeopardize present rates which are tied to the cost-of-living index.

• • •

Certificates of necessity for nearly 7000 new or expanded facilities have been given Washington's blessing. Proposed investment in these facilities tops $14 billion.

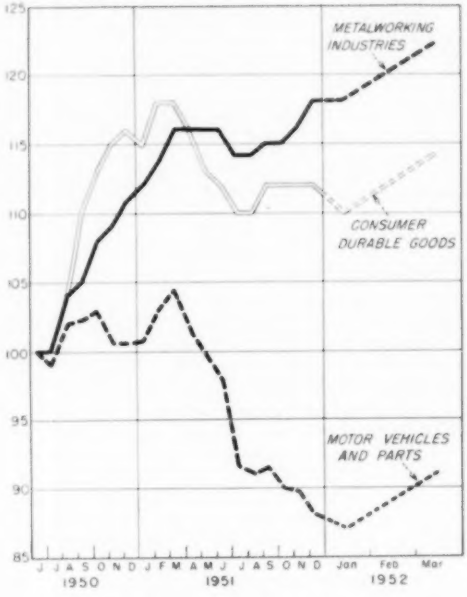
One should remember, however, that many of these certificates have not been acted upon, and may never be.

Non-agricultural employment tops that in the early months of last year. But it has been slipping off month by month lately.

Despite the fact that many barometers have moved down slightly, industrial production still is on an exceptionally high basis and promises to remain there.

Materials Cutbacks Haven't Hurt Over-All Metalworking Employment

(See story page 169)



WEEKLY BUSINESS INDICATORS

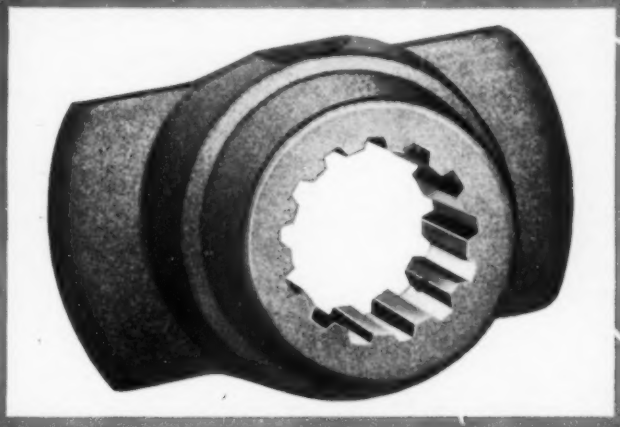
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	237.3	237.2	237.9
Steel ingot production (thousand tons)	2104	2096	2019
Electric power output (million kilowatt hours)	7416	7461	6822
Production of automobiles and trucks	115,918	110,542	177,356
Engineering construction awards (*Engineering News-Record*, millions)	$296.6	$165.7	$258.9

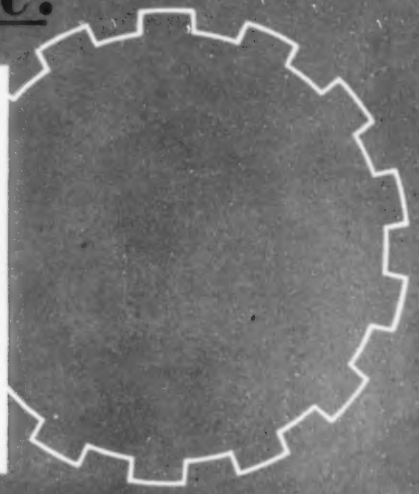
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	275	211	489
Vacuum cleaners sales (thousands of units)	223	230	282
Washers sales (thousands of units)	214	219	321
Household electric ranges sales (thousands of units)	89	73	132
Radio production (thousands of units)	632	851	1202
Television production (thousands of units)	405	469	646
Gear sales index (1935-1939 = 100)	670.6	716.5	764.6
Foundry equipment new orders index (shipments, 1937-1939 = 100)	404.5	230.5	668.0

* Seasonally adjusted.

Lower Cost-per-piece:





BROACH REDESIGN *cuts tool costs—boosts life*

SAVES *$450.00* MONTHLY

Redesign of the tools for this spline broaching operation resulted in a 24% reduction in original tool cost, 22% increase in the number of sharpenings per tool as well as a 14% increase in the parts produced per sharpening. The result in terms of cost-per-piece was a net saving of $480.00 per month.

Slight savings in production and sharpening time were effected due to the fact that this redesigned tool was shorter than the original. However, in many cases lowest cost per piece can be achieved only through redesign which increases tool length . . . a decision which is best made for each application by qualified broach specialists.

This spline operation is but one typical example of how Detroit Broach specialization in broaches and broaching tools pays off. Such specialization provides a back-log of experience which is unparalleled as the basis for sound recommendations. Whether you are considering conversion to broaching or more for your money on present broaching operations, don't fail to consult Detroit Broach. We will be very happy to supply actual cost and production data.

DETROIT BROACH CAN CUT YOUR COST-PER-PIECE *by*

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Morris "double header" performs 29 operations with a single loading!

Two heads are definitely better than one when you want higher production at lower cost. The MORRIS Horizontal Two-Way, 6-Station Machine illustrated here is a good example.

It drills, reams, spotfaces and taps all holes in crank shaft main bearing caps, performing 29 operations with a single loading and is production rated at 70 pieces per hour at 80% efficiency.

A self-contained hydraulic unit mounted on a slide on the right-hand side of the machine carries a 14-spindle head. A similar slide on the left-hand side of the machine carries a 12-spindle head. One single spindle unit, mounted angularly at Station 6 drills a 1/4" hole while a lead screw tap feed, mounted horizontally, taps a 5/16-18 hole.

OPERATIONAL SEQUENCE

STATION 1	Load
STATION 2	RIGHT HAND HEAD: Drill 2 holes for 5/16—18 tap. LEFT HAND HEAD: Drill Thru 2 17/32 Dia. holes. Drill Thru 4 37/64 Dia. holes.
STATION 3	Idle
STATION 4	RIGHT HAND HEAD: Spotface and Chamfer 6— .94" Dia. Bosses LEFT HAND HEAD: Drill Thru 4 37/64 Dia. holes.
STATION 5	RIGHT HAND HEAD: Spotface and Chamfer 4— .94" Dia. Bosses Chamfer for 5/16-18 tap 2 holes. LEFT HAND HEAD: Ream 2 holes .578—.577.
STATION 6	ANGULAR AUXILIARY UNIT Drill 1/4 Dia. Angular Hole. RIGHT HAND HEAD: Tap 2 5/16—18 Holes. LEFT HAND HEAD: Idle.

If your work requires numerous drilling, reaming, tapping, boring and similar operations on a mass production basis, your inquiry is invited.

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MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

What Redesign Will Do

Have you taken a critical look at the design of your products lately? If not, don't you think that you should?

Others have. Some have done so by necessity. They have been faced by the practical difficulty of using substitute materials in this time of shortages. Those substitutes can often be put to work much more efficiently and economically if the design is changed to ease production problems.

Still others have found it expedient to alter designs to help automatize manufacture. This automation brings about much higher productivity. It also helps to eliminate the human drudgery involved in doing highly repetitive work hour after hour.

WHAT'S MORE, full benefits from an automatic line can be achieved only if the product is specially designed for mechanized production. The savings are far greater than if an attempt is made to produce an existing item by automatic means.

At least a few companies go so far as to examine their products constantly under the microscope to see if a change in design will result in better quality and a lowering of costs.

Right now, a jet-engine builder is deeply immersed in redesigning an imported engine to make practical its mass production at reasonable cost. Other similar projects, mostly of domestic origin, are part of the current defense program.

ALL OF WHICH leads up to one point: Close coordination between the design engineer, the metallurgist and your manufacturing office is more vital than ever before.

The three should work on intimate terms. If they do, your chances for success in the stiff competitive era ahead will be much enhanced. You will possess a real advantage over your less foreseeing rival.

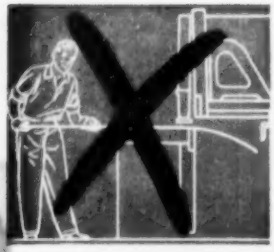
"The company with an organization plan that insures close coordination between the product designers and the manufacturing people, from the clay model or basic-design stage to final design and production release," Del Harder, vice president of the Ford Motor Company, said, "will get a better designed product and one which can be produced at the lowest possible cost."

That is the pay-off. It is worth lots of time, attention and money. If you haven't done so, why not try such a plan?

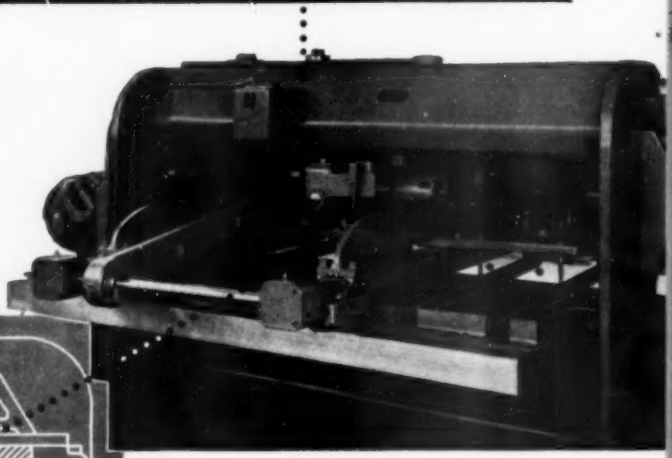
Burnham Finney

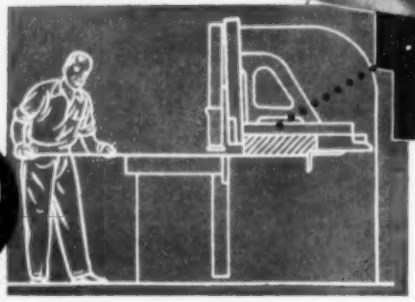
Another Cincinnati Feature

. . . the No-Sag Magnetic Sheet Support



Troublesome Sag





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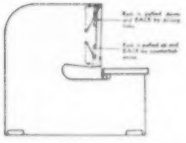
Produces the most accurate shearing in the field and gives six major advantages — including shearing different thicknesses without changing knife clearance.



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Accurate to .002"—easy to use. Power front or standard hand control.

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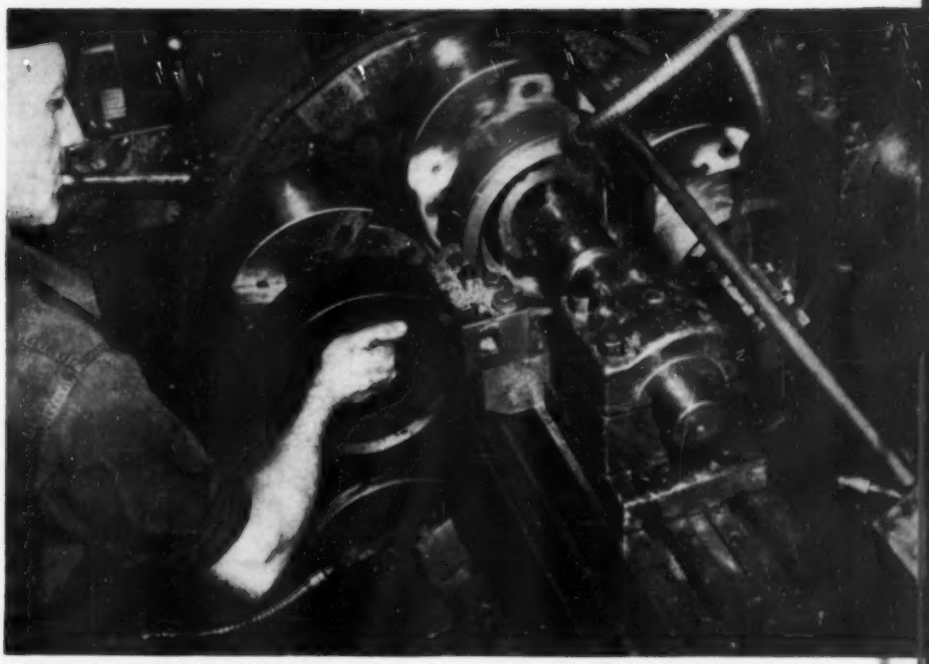
CINCINNATI

equals seven machines



MULTI-SPINDLE AUTOMATIC CHUCKER was purchased to permit increase in production. Analysis shows sizeable next-year gain over competitive single-spindle machines. Details of analysis appear on following pages

PLANT-WIDE PLANNING STRETCHES NEW-EQUIPMENT DOLLARS

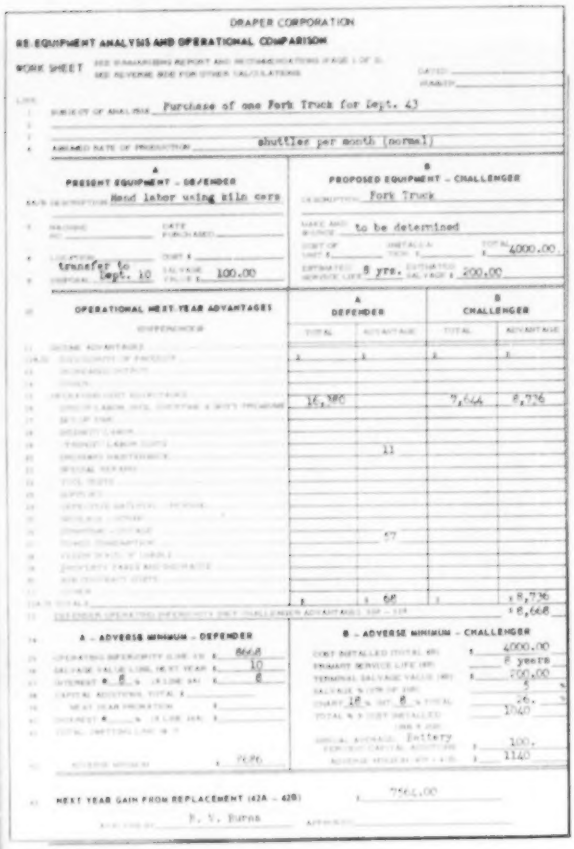
Planned purchases of "MAPI-measured" machines insures Draper Corporation of the maximum return from new-equipment dollars. Here is how the program operates, plus several examples of typical job improvements

WHERE will a dollar invested in new equipment do the most good? What is the over-all company picture on machine tools and equipment? What gain will result from a new machine, a new industrial truck, or a new spray booth? Answers to these and many other questions are found in a company-wide equipment program operating at Draper Corporation, Hopedale, Mass.

Major objectives in Draper's program are to determine in advance equipment needs in the entire company and to plan in detail exactly how these needs can best be met. This is done by a plant survey of existing methods and by MAPI analysis of each major item of equipment that shows possibilities for improving present performance. From these data, an equipment budget is prepared and submitted to top management for review and approval.

BY MILES J. ROWAN, Associate Editor

standard analysis shows whether new equipment is justified



DRAPER CORPORATION

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

WORK SHEET

Purchase of one Fork Truck for Dept. 43

shuttles per month (normal)

	A PRESENT EQUIPMENT – DESCRIPTION	B PROPOSED EQUIPMENT – CHALLENGER
	Hand labor using kiln cars	Fork Truck
		to be determined
	transfer to Dept. 10	8 yrs.
	100.00	200.00
		4000.00

OPERATIONAL NEXT YEAR ADVANTAGES	A DEFENDER TOTAL	A DEFENDER ADVANTAGE	B CHALLENGER TOTAL	B CHALLENGER ADVANTAGE
	16,380		7,644	8,736
		11		
		57		
		68		8,736
				8,668

A – ADVERSE MINIMUM – DEFENDER		B – ADVERSE MINIMUM – CHALLENGER	
	8668		4000.00
	10		8 years
	8		200.00
			4
			10%
			1040
	7696	Battery	100.
			1140

NEXT YEAR GAIN FROM REPLACEMENT (42A – 42B) 7564.00

P. V. Eaton

DRAPER CORPORATION

SUMMARIZING REPORT AND RECOMMENDATION

DATED June 13, 1951

NUMBER 43-51-1

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

PAGE 1 OF 2

SUBJECT OF ANALYSIS Purchase of one Fork Truck for Dept. 43

RESULT – GAIN FROM REPLACEMENT: $7564.00

– REQUIRED INVESTMENT: $4000.00

COMMENT AND SPECIAL EXPLANATION

Employing a power stacker to transport and store shuttle blocks, as suggested in Mr. John R. Bell's note, will reduce the handling costs from $9.75 to $4.55, a saving of $5.20 per 1000 blocks. The blocks will be palletized when unloading the railroad car and will remain as such until processed at the Porter Planer in Dept. 49. The use of pallets will eliminate the need of kiln cars. Building changes can be made in the future to remove the doors now required in use of kiln cars and construct a solid wall. This will permit better control of the moisture removal process in the kiln.

Tiering of the palletized loads can be accomplished with the stacker resulting in greater volume of storage. After the required processing the palletized loads will be transported by the stacker to Dept. 49

RECOMMENDATION That a power stacker be purchased for Dept. 43

APPROVAL AND COMMENT

BY

DATE

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARSION is based on MAPI formula. Old method is the defender, column *A;* new method is the challenger, column *B*. In this case, next year's gain will pay for new fork truck in less than seven months

While the proposed budget usually is trimmed at this point, a substantial amount is invested in new machine tools and equipment each year. For 1951 and for several years prior, well over a million dollars have been invested in machine tools alone.

Responsibility for operation of the program centers in the Planning Department. As Planning also is responsible for manufacturing methods, including the design of any special machines that cannot be obtained from machine tool builders, the men who are responsible for the purchase of new equipment are in a position to know intimately the current methods of production in the shop.

Equipment studies by the planning department actually originate in two ways: First, an annual survey is made for preparation of the budget. Second, continual methods improvement is carried on throughout the year. In this way, long-range planning is possible, yet the flexibility needed to take care of fluctuating current requirements is retained.

A Plant Survey Is Made

In preparing the equipment budget for the year, requests are divided into two classifications. The first includes equipment ordered or recommended for immediate purchase. The second classification is for equipment under consideration for purchase in the near future. On this list, certain items are starred to indicate preference. In reviewing the proposed budget, top management deletes items in the second classification, if some paring of expenditures is required.

When the next budget is prepared, a list of all items previously requested and not yet obtained is made up by Planning and submitted to the shop superintendent, together with copies for individual shop foremen. Each foreman reviews the list in the light of current needs and makes any changes and additions required. This list then is returned to Planning where an analysis based on the MAPI formula is made of each request.

how Draper figures which machine to buy

DRAPER CORPORATION

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

WORK SHEET — SEE SUMMARIZING REPORT AND RECOMMENDATIONS (PAGE 1 OF 2). SEE REVERSE SIDE FOR OTHER CALCULATIONS. DATED Jan. 12, 1951. NUMBER 5-51-1

LINE

1 SUBJECT OF ANALYSIS: Selection of the correct additional machine needed as a
2 result of present machines being overscheduled.
3
4 ASSUMED RATE OF PRODUCTION: Normal level of production - xxx looms per month

	A — PRESENT EQUIPMENT - Challenger	B — PROPOSED EQUIPMENT - CHALLENGER
5A/B	DESCRIPTION: 7 "A" Machines	DESCRIPTION: 1 "B" machine
7	~~Cost of unit~~ DATE PURCHASED	MAKE AND SOURCE
8	~~Cost of unit~~ 13,000 COST $ 91,000	COST OF UNIT $ 36,000 INSTALLATION $ 1000 TOTAL $ 36,000
9	~~Service life~~ 12 yrs. SALVAGE VALUE $ 13,650.00	ESTIMATED SERVICE LIFE 12 yrs. ESTIMATED SALVAGE $ 5400.00

10 OPERATIONAL NEXT-YEAR ADVANTAGES (DIFFERENCES)	A CHALLENGER TOTAL	A CHALLENGER ADVANTAGE	B CHALLENGER TOTAL	B CHALLENGER ADVANTAGE
11 INCOME ADVANTAGES				
12A/B SUPERIORITY OF PRODUCT				
13 INCREASED OUTPUT				
14 OTHER				
15 OPERATING COST ADVANTAGES				
16 DIRECT LABOR, INCL. OVERTIME & SHIFT PREMIUMS	3800		3800	
17 SET-UP TIME				
18 INDIRECT LABOR	300.			300.
19 "FRINGE" LABOR COSTS	410.		380.	30.
20 ORDINARY MAINTENANCE	1200.		171	1029
21 SPECIAL REPAIRS				
22 TOOL COSTS	same			
23 SUPPLIES	300.		100.	200.
24 DEFECTIVE MATERIAL — REWORK	same			
25 SPOILAGE — SCRAP	same			
26 DOWNTIME — OUTAGE	same			
27 POWER CONSUMPTION	1374.		784.	963.
28 FLOOR SPACE, IF USABLE	784.		114.	670.
29 PROPERTY TAXES AND INSURANCE	1364		240.	824.
30 SUB CONTRACT COSTS				
31 OTHER				
32A/B TOTALS	$ 9407	$	$ 5490	$ 4017

33 DEFENDER OPERATING INFERIORITY (NET CHALLENGER ADVANTAGE): 32B - 32A = 4017

	Machine "A" — A — ADVERSE MINIMUM - DEFENDER		Machine "B" — B — ADVERSE MINIMUM - CHALLENGER	
34			COST INSTALLED (TOTAL 6B)	$ 36,000
35	OPERATING INFERIORITY (LINE 33)	$ 91,000	PRIMARY SERVICE LIFE (6B)	12 yrs.
36	SALVAGE VALUE LOST AT 12 YEAR	$ 12 yrs.	TERMINAL SALVAGE VALUE (6B)	$ 5400
37	INTEREST @ % (X LINE 8A)	$ 13,650	SALVAGE % (17% OF 35B)	15 %
38	CAPITAL ADDITIONS, TOTAL	$ 15%	CHART 10 % INT., 8 % TOTAL	18 %
39	NEXT YEAR PROVISION	$ 18%	TOTAL % X COST INSTALLED (36B X 35B)	6480
40	INTEREST @ % (X LINE 16A)	$ 16,380		
41	TOTAL, OMITTING LINE 38		ANNUAL AVERAGE PERIODIC CAPITAL ADDITIONS	$ 6480
	Operating inferiority 4,017.		ADVERSE MINIMUM (40B + 41B)	$ 6480
41	ADVERSE MINIMUM	$ 20,397		

43 NEXT YEAR GAIN FROM REPLACEMENT (42A - 42B) $ 13,917

ANALYZED BY DVB & JEB APPROVED

DRAPER CORPORATION

SUMMARIZING REPORT AND RECOMMENDATION

DATED Jan 12, 1951

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

NUMBER 5-51-1

PAGE 1 OF 2

SUBJECT OF ANALYSIS

Determination of most economical method of producing additional loom parts and anti-friction bearing housings, needed as a result of present machines being overscheduled.

RESULT — GAIN For Machine "B" $13,917.00

REPLACEMENT

— REQUIRED INVESTMENT

$36,000 next year for one Machine "B" in comparison with $91,000 next year cost of additional facilities of Machine "A" now producing these parts.

COMMENT AND SPECIAL EXPLANATION

The part used for a comparison of the two machines is L-6249 on which production estimates were given by the respective manufacturers. One 6-spindle machine "B" can produce 204 pieces per hour against 29.4 pieces for one single-spindle machine "A". Therefore, we have pitted one machine "B" against seven "A" machines. This seven-machine basis is taken as an average condition, for in some cases 5 machines could do the work of one, whereas in other cases 10 machines would be required.

RECOMMENDATION

That one "B" machine be purchased to relieve present overburdened equipment.

APPROVAL AND COMMENT

BY _____

DATE _____

TWO DIFFERENT NEW MACHINES can be compared on standard analysis form, changed during typing as shown above. This practice insures consideration of all major factors in deciding which machine is best suited to Draper production requirements. On actual form, machines are identified

MAPI Studies Are the Guide

The MAPI method of re-equipment analysis was adopted by Draper because it provides a means of evaluation that takes into consideration all the factors that commonly enter into a decision on equipment purchasing. It provides a common base upon which the worth of all proposals can be measured and, as it leaves nothing to be assumed, it is a formula that produces consistent results, regardless of who makes the analysis. Management can be sure that the method of analysis is sound, and that they have the best available information upon which to base their decision.

Standard forms that include all necessary data for the analysis have been developed. These are self-explanatory with the possible exception of lines 38 through 42 for the *challenger*, column *B*. The *salvage %*, line 38, is obtained by dividing the *terminal salvage value*, line 37, by the *cost installed*, line 35. In line 39, the *chart %* is obtained directly from the MAPI chart and is determined by the *primary service life* and *salvage %* of the challenger. This *chart %* accounts for future deterioration and obsolescence of the new equipment at a rate that will make it replaceable at the end of its service life. Interest on the investment then is added, and the *total %*, line 39, is applied to the *cost installed*, line 35. Any capital additions that may be required during the coming year are added, line 41, to give the total *adverse minimum*, line 42. Entries for the *defender*, column *A*, are totalled, and the difference in *adverse minimums* between defender and challenger is shown on line 43 as the *gain from replacement*.

Foremen Are Consulted

In preparing the *re-equipment analysis*, a Planning Engineer checks each request on the manufacturing floor. He observes the operation, discusses the job with Standards, talks with the foreman, operator, and everyone concerned with the job. When the analysis is completed, the foreman is given

detailed specifications on what is to be ordered, as well as the full tooling that will be provided. If he has any further suggestions at this point, every attempt is made to adopt them, and to provide the setup that he wants for the job. Draper firmly believes that full cooperation must be obtained from the line organization to obtain best results from their replacement and methods program.

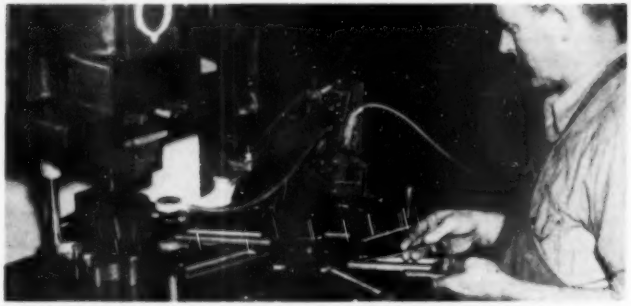
Methods Are Studied

Many suggestions for better methods and new equipment come throughout the year from foremen, from management, and from operators, as well as from the Planning Department. While the overall survey is made annually, methods-improvement is carried on continually. Activity, labor content, and labor rate all are considered. These factors, plus familiarity with the product and with alternate production methods, permit Planning to evaluate opportunities for cost reduction.

Wherever possible, machine tools are purchased completely tooled and ready for production. As Draper produces a variety of different textile looms, a large number of parts must be processed. Tooling, therefore, often is extensive to accommodate the full range of parts required on a single machine. In some cases, the cost of tooling exceeds the cost of the machine. Planning also designs special machines for operations peculiar to the production of looms, if these machines cannot be obtained from regular machine-tool builders. In other cases, Planning works in close cooperation with machine-tool manufacturers to develop or adapt a machine to Draper requirements.

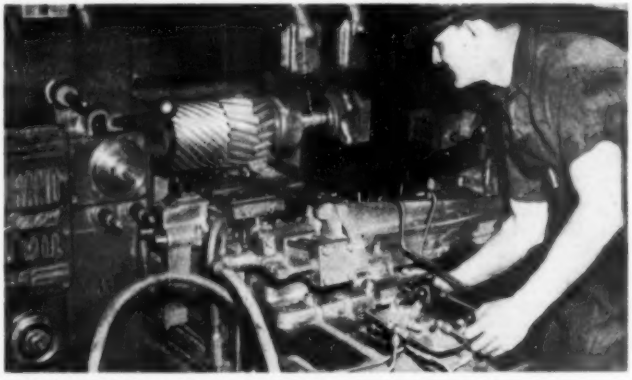
While Draper has had a regular program of machine-tool replacement for at least 20 years, it is only since 1945 that the program has been organized in its present form. And it is only since 1950 that MAPI-analysis procedures have been applied extensively. However, experience thus far indicates that an organized procedure of replacement is of real value in keeping plant efficiency high.

doubles production



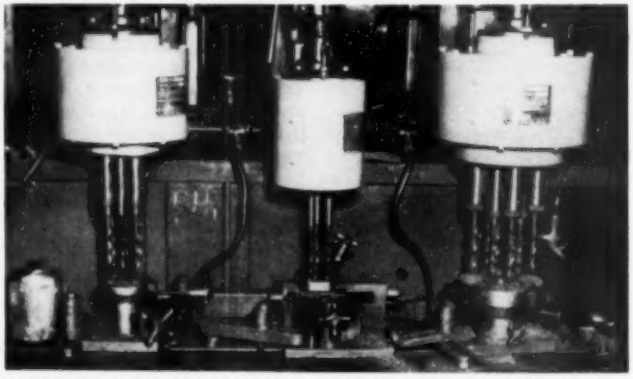
AUTOMATIC FEED on new V&O mechanical press provides maximum safety for operator and gives more than twice the output formerly obtained on hand-fed press. Job is coining operation on shuttle spring

ups output 39%



NEW SUNDSTRAND MILLING MACHINE form-mills 12-in. wide section of loom component at 11 ipm. Special fast-acting hydraulic fixture holds all sizes of piece. Machine has 2½-in.-dia special arbor and extra-heavy support arms to permit wide cut at high-feed rate

boosts drillpress capacity

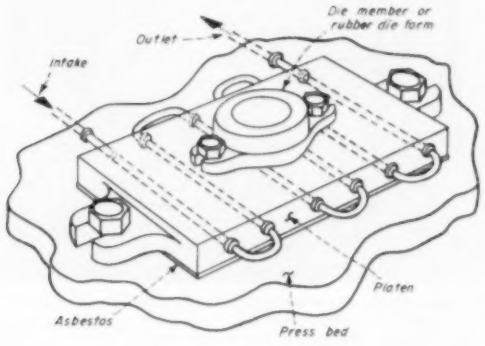


MULTI-SPINDLE DRILLHEADS, applied extensively throughout drillpress department, broke bottleneck and eliminated need for additional capacity. Output rose and operators benefited from increased productivity

HOT PLATEN FORMS MAGNESIUM EASIER

Some metals require hot pressing; magnesium is one. This method saves expensive tooling

BY FRANK CHARITY
LOS ANGELES, CALIFORNIA



Holes are drilled through the platen or bolster and interconnected to form a closeted circuit. Steam, gas-heated air, or an electrical resistance heating unit can be passed through the core to provide the necessary heat. Form blocks placed on the platen are then heated without special tooling

A lower press platen cored to permit heating alloys Consolidated Vultee Aircraft Corp to form magnesium alloys by the Guerin rubber-die process.

Temperatures of 300 to 600 F are necessary to form all but the thinnest magnesium sheet, as the latter will not flow properly at lower temperatures. Heat is usually conveyed to the sheet stock by the forming tools to avoid stock-preheating difficulties. This causes no major trouble where mating dies or stretcher forms are used, as these may have integral electric heating elements. It is not practical to heat internally each of the inexpensive form blocks required by the Guerin process.

Convair's platen is cored so that it may be heated with gas, steam, or electricity. Then it is mounted over an asbestos pad on the press bed, to prevent its heat being rapidly dissipated by the massive press structure.

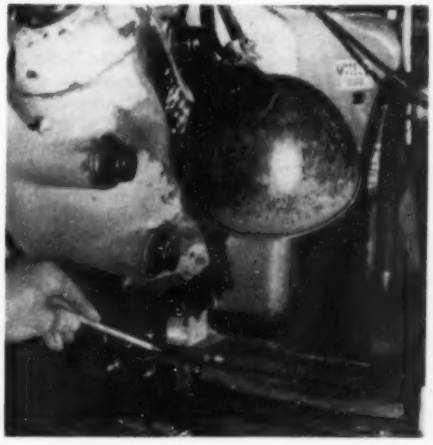
Form blocks, usually comprising cast-alloy materials, are heated by mounting them on the press platen in the conventional manner. Thermostatic controls are normally used to prevent heating of the form-blocks to temperatures exceeding 400 F. Otherwise, the most heat-resistant rubber pressure pads will deteriorate rapidly.

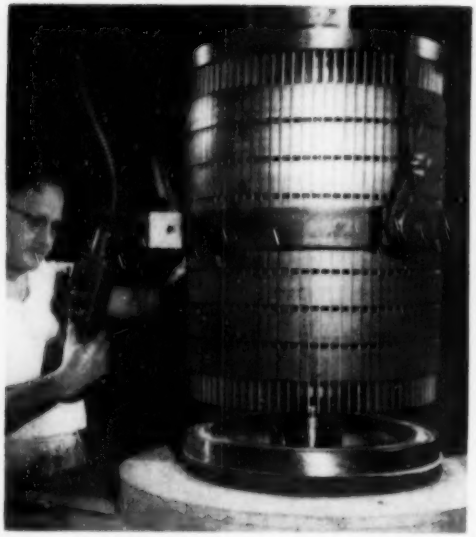
SLAB CHUCK GRIPS PARTS BY VACUUM

DEVELOPED by Boeing Airplane's Engineering Department, a new chuck holds flat-bottomed parts firmly for quick machining jobs when setup time can be saved with this simple gripping method.

The chuck is really a flat steel block, machined inside and out, and fitted with air-hose connections. In the top surface of the block there are four rubber-lined air ports that are flush with the block. The work is dropped over one or more of these, and the others are closed off with positive plugs to prevent leakages. A hose connects one of the fittings in the side of the block to the plant vacuum system. Unused fittings are closed off.

As a replacement for conventional chucks or milling fixtures, the chuck is effective. At Boeing, up to 50% of the regular setup time can be saved. Proof of the holding power of the chuck is illustrated; a steel block is being V-grooved by an angled milling cutter, with only one of the ports holding the work.





Rotor assembly is lowered onto rotor ring which has been positioned on pancake induction coil which rests on a thick Transite insulator

Pancake coil fits around hub on insulator which serves to locate the rotor ring. The heavy insulator is required to prevent overheating the lower platen

INDUCTION BRAZES SQUIRREL CAGE

By P. H. BRACE, consulting metallurgist, Research Laboratories, and E. B. FITZGERALD, Transportation and Generator Div, Westinghouse Electric Corp

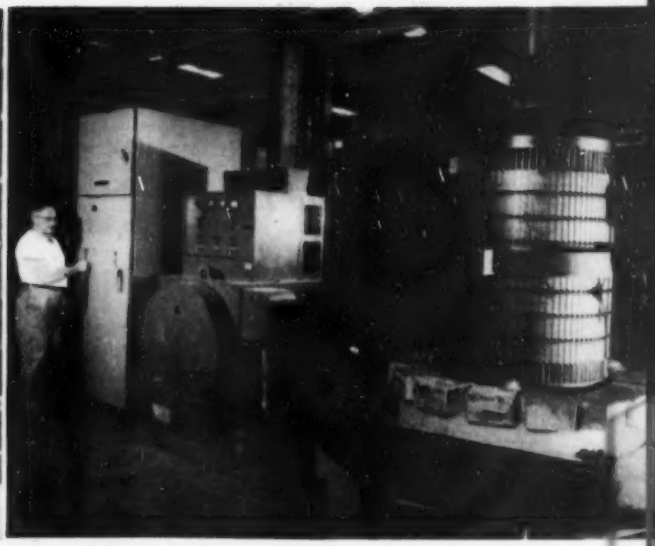
Brazing the end ring to the rotor bars of squirrel-cage rotors has long been considered a difficult and troublesome task. The problem is to braze each of many (sometimes over 100) closely spaced copper bars, extending beyond the stator iron, into a copper short-circuiting ring. The conventional method has been to braze the bars to the ring individually, with tongs. This is time consuming, and offers the possibility of inconsistency between bars, which can lead to trouble in service.

Now, however, Westinghouse has worked out a method of induction heating which does a much better and faster job. It is generally applicable to a wide variety of motor sizes, and to other jobs as well, but it has been an outstanding success on a production run of several hundred squirrel-cage induction motors designed for a class of service where the highest order of reliability, uniformity and efficiency are required. All bars are brazed at one time, in three or four min, with energy supplied from a 9600-cycle generator, and all connections are necessarily alike.

Extensive tests were made to arrive at the best method of applying the high-frequency heat. For the preliminary tests, the inductor coil available spanned only a part of the rotor-ring circumference. Results of these tests, however, showed that heat can be generated rapidly in the ring. It also became apparent that adequate power must be available to do the job quickly, and avoid excessive temperature rise and consequent buckling of the rotor iron. After trying various arrangements of the induction coil, the one most suitable proved to be a simple pancake inductor coil placed as close as possible to the end plane of the rotor ring and designed to supply sufficient power to heat the entire ring quickly and uniformly. The basic elements of a practical routine were established for brazing the ring to the bars in less than 5 min.

The tests showed also that it is important to provide a strong axial force for holding the ends of the bars parallel. This is accomplished by a rig operated by an air-actuated cylinder located beneath the brazing table. It applies an axial compressive force of a few thousand pounds between an aligning plate bolted to the top end of the rotor and a steel foundation platen. The latter carries the inductor coil and Transite insulating rings used to space the

Temperature of rotor ring is measured with a thermocouple which, with simple instrumentation, controls power input to the coil



Pneumatic cylinder under table applies axial pressure to rotor bars through yoke bearing on upper ends. Insulating blocks surround ring to avoid drafts and localized chilling

High-power generator, a new powdered flux, and a simple setup combine to braze copper bars to rotor rings automatically in a 4-min. operation. An unbrazing technique has also been developed

coil and platen and avoid overheating the latter.

The brazing alloy is applied in the form of specially designed one-piece rings of correct weight, preplaced in the channel machined in one face of the rotor ring. Thus, all bars make thermal contact with the rotor ring through the brazing alloy. As the temperature rises, the alloy yields under the force applied by the compression rig. This establishes intimate thermal contact, and the heat flows rapidly into the ends of the bars, so the joints are wetted quickly after the brazing alloy has melted. This scheme permits the use of high power input without overheating the rotor rings, and provides minimum heat flow into the bars.

A new flux also has been developed that is far superior to ordinary fluxes for this purpose. The usual alkaline borate flux, having water as a vehicle, foams as the water is driven off during fusion. The foam piles up to a depth of 1 in. or more and remains as an undesirable deposit on the bars. Also, the foam prevents visual observation of the progress of the operation. The new flux employs essentially the same ingredients, but is processed to eliminate all but traces of water. The result is a crystal-clear, pale green, dry granular powder. It is entirely effective insofar as fluxing action is concerned, and there is no foaming. Thus, the progress of the fusion of the brazing alloy and its action as it wets the submerged ends of the rotor bars can be clearly seen, and any occasional minor irregularities corrected. This means greater assurance of high-quality brazed joints.

During the preliminary development work, temperatures were controlled by observation. However, it soon became evident that the process could be carried on with such regularity that it can be done automatically. A thermocouple placed in the ring, in conjunction with simple instrumentation, controls the power input and maintains a predetermined temperature for as long as desired.

Because of the high thermal expansion factor of copper, the diameter of the ring in these large rotors changes ¼ in. during heating and cooling. This has not proved to be troublesome, however, because the expansion is readily accommodated by suitable ring design.

The generator is a Westinghouse 150-kw, 9600-cycle machine with a 2300-v, 60-cycle, 3-phase driving motor. It has been found useful for a variety of other work, such as armature brazing, and stator winding brazing.

The technique of unbrazing joints also has been developed, using the same equipment, with a tremendous reduction in the time required.

WHEN AND WHY A SPECIAL MACHINE?

There are four justifications for a special-purpose machine . . . Unless the unit has one or more, and meets production requirements too, it is unsound . . . Here are examples of special machines for current Canadian jobs

BY C. P. FARR
Chief Engineer
Modern Tool Works, Ltd.
Toronto

LATHES, drillpresses, and milling machines are standard machine tools, although they are frequently specially tooled. Further, there are special lathes, drillpresses, and milling machines — and yesterday's special may be tomorrow's standard, if demand justifies production in sufficient quantities. But to buy a special machine when a standard, possibly specially tooled, will do the job, is unnecessarily costly.

One or more of four basic reasons justifies purchase of a special-purpose machine. In order of importance, these basic reasons are:

1. **Decreased cost**
2. **Improved quality of work**
3. **Operation impossible on standard machine**
4. **Reduced worker fatigue**

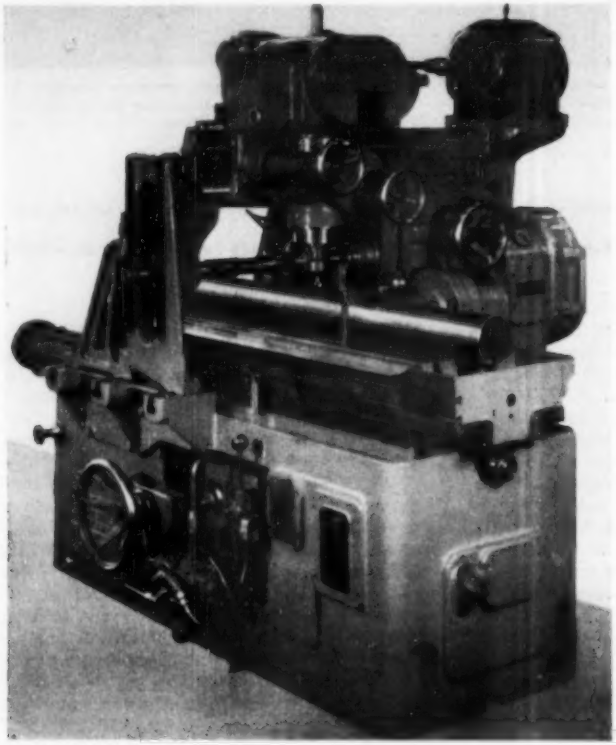
Some special machines satisfy one of these requirements; some may satisfy all. But be careful not to let your first enthusiasm for a new idea or brainstorm overshadow facts. Make a cold, hardheaded investigation of the cost, analyze the production potential—in other words, be sure the machine is warranted by your schedule.

Will it pay for itself? In Canada, this often is a major problem, because we just do not have the unit volume in any manufactured item that is typical in the United States. Very often, we must combine similar jobs on one machine, remembering that setup can be so time-consuming that it robs us of potential production savings on short runs.

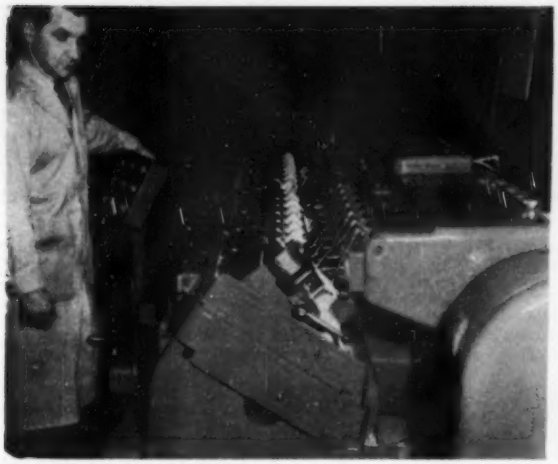
A machine may be overtooled — and thus too productive — also. If production demand is for 40 pieces per day, it is false economy in most cases to purchase a machine that can produce 400—the investment is greater than necessary.

Future model changes must also be considered. A forthcoming model change certainly justifies provisions to accommodate it, but too much attention to possible future requirements may result in an expensive universal machine, or one with good design jeopardized for something that may never be required.

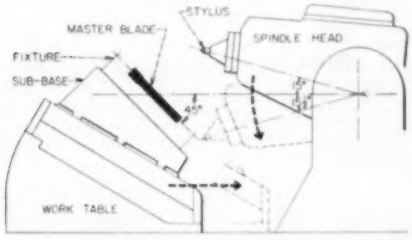
To illustrate these points, I have selected pictures of several recent special Canadian units. In each case, numerals at the end of the description list which of the four basic reasons they exemplify.



STANDARD, BUT SPECIAL TOOLS.. Here is a standard milling machine, specially tooled to cut blind and feather keyways in shafting up to 8 in. dia. First cut is taken with a standard keyseat or side milling cutter. Then an end mill on the special vertical attachment on the overarm cleans out the radius. The valve at lower front provides reverse feed. Demand has been large enough for such a machine that we will build a 2-direction feed control into the panel, eliminating the extraneous valve and producing a new (for us) standard machine—a keyseater (1)



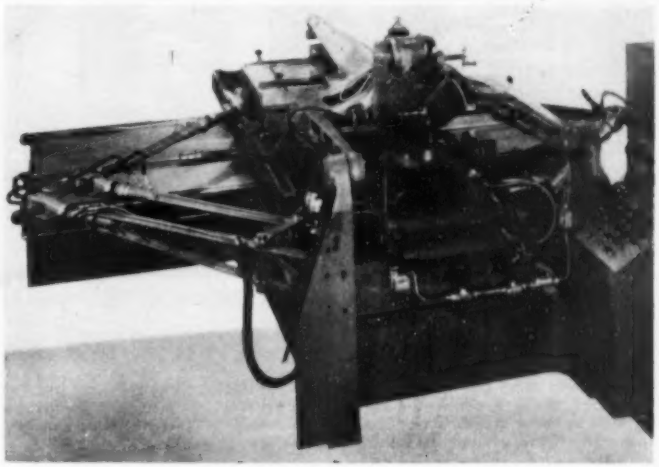
BLADE CONTOUR MILLER.. Vast numbers of turbine blades are required for the *Orenda* jet turbine to form tolerances of 0.003 in. Materials are stainless (for 4 of 10 rows in the compressor section) and tough Nimonic (turbine rotor). Stock removal is about 1/16 in. With engineers of A. V. Roe (Canada) Ltd, we developed this special machine tool, a 14-spindle hydraulic duplicator with center master. Hydraulic cylinders move the head, carrying the tracer stylus and 14 spindles, pivoted on preloaded ball bearings at each end. Spindles are driven by a common shaft through 90° skew bevel gears. Spindles can readily be removed for servicing. Master blade and blanks are held by a special fixture on the worktable which moves on precision bearings under the influence of spindle-head movement. These machines cut blade-making time 75%, and we expect to better that with a new type of cutter **(1, 2)**

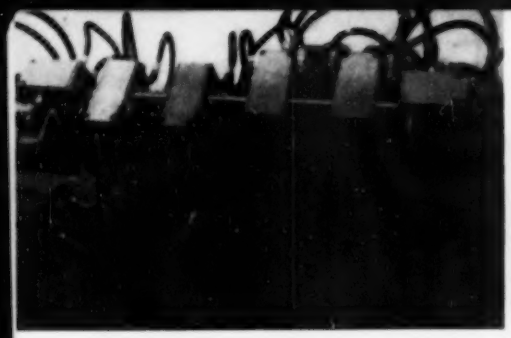


ACTION.. As the spindle head pivots down toward the work, the stylus engages the master, and the worktable is thereafter actuated to and from the end mills under action of the hydraulic tracer, thus generating the required form. After each cutting stroke, the spindle head rises to clear, and the table automatically indexes longitudinally for the next stroke. An electro-hydraulic control system makes the complete cycle automatic, and surface finish and accuracy are sufficiently high to reduce succeeding operations to a minimum

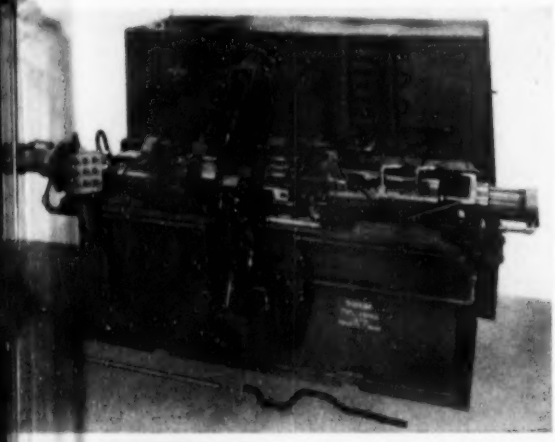
DIE-CAVITY GRINDER

There are also six rows of aluminum compressor blades in the *Orenda* turbine. These are formed and coined by die-forging. This pantographic duplicating grinder precision-grinds blade-die cavities. It works from a plaster master five times actual size of the die cavity. By adjusting pantograph arms which couple worktable and master table, compensation for shrink allowance can be made for grinding rough-forging dies. Hydraulic cylinders in pantograph arms and in yoke-shaped boom that supports wheelhead and follower do the adjusting against preset stops. Then a button on the control panel will bring the arms back to an exact 5 to 1 ratio for grinding coining dies. The follower is counterbalanced to 5 lb pressure **(1, 2)**

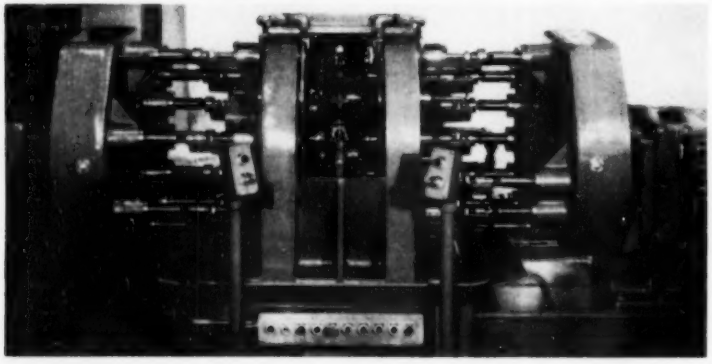


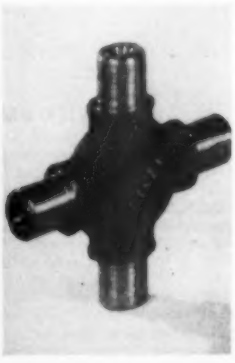


CRANKBENDER.. Improvement in quality frequently accompanies cost savings in development of a special machine. This hydraulic crankbender is a classic example. The former method used by Massey-Harris to make a combine crankshaft was to butt-weld two forgings at the center, then machine the four throws and the main bearings, requiring about 75 min. This setup produces a stronger, better balanced crankshaft from 1 1/16-in. cold-rolled bar stock in 4½ min, with no subsequent machining. At left, above, jaws are open and the stock in place. Automatic cycle control closes the jaws, then passes 10,000 to 12,000 amp at about 16 volts (from a built-in 300-kva, single-phase, air-cooled transformer in the base) through the bar from end to end. The bar is heated to about 1800F in 1 min. A timer automatically cuts current off and starts hydraulic bending, requiring about 2 tons of thrust per throw. Jaws are interconnected by a linkage so they move in a predetermined arc; this prevents stretching or compressing the stock and generates a natural bend. Adjustable positive stops control amount of bend; on this 2-in.-throw crank, we overstroke about 0.050 in. to allow for shrinkage during cooling. Bending takes about 5 sec, and bending pressure is held on for 15 sec longer to give the shaft a permanent set (right). Then bending pressure is relieved and water forced through the water-jacketed clamped jaws for 3 min to cool the part, after which a timer opens the jaws **(1, 2)**

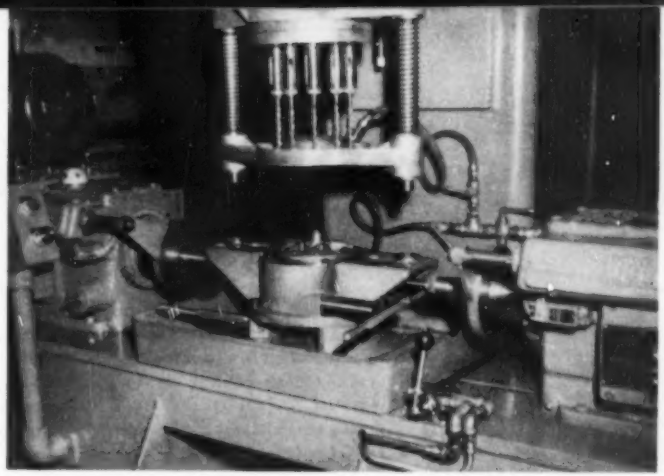


◂ **SECOND BENDER..** Building this 3-throw crankbender for the Massey-Harris hay rake and gaging it with the combine crankbender permits one operator to handle both machines. He also has time to cut stock for both machines. Similar units are now being built for use in the United States **(1, 2)**



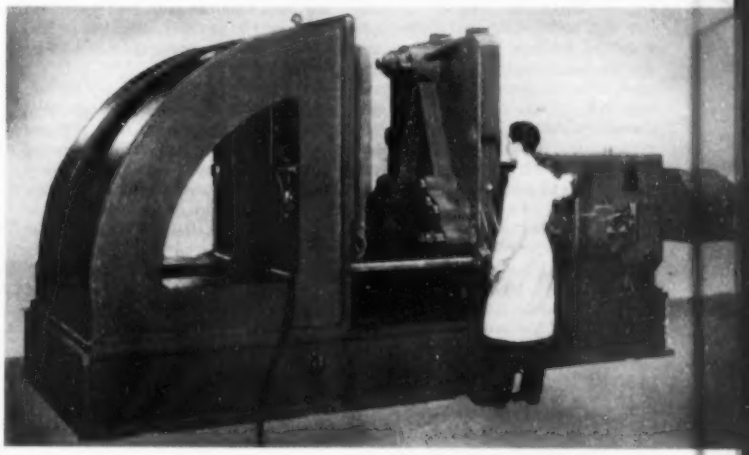


7-STATION AUTOMATIC.. To produce 180 universal joints for automobiles per hour at 80% efficiency, this 7-station, horizontal-trunnion, indexing machine was built. It hollow-mills the OD of each arm within 0.005 in. and faces the end within 0.005 in. of center line, then drills a center grease hole all the way through in three stages. Parts are processed in pairs, and each travels around the machine twice, the operator rotating the piece 90° after the first cycle. The operator merely removes the finished piece, rotates the half-finished one, and loads a rough forging as each station comes to position; clamping and indexing are automatic. To keep the machine busy, it is provided with interchangeable fixtures to produce four sizes of joint; thus it meets all four requirements for a special unit **(1, 2, 3, 4)**



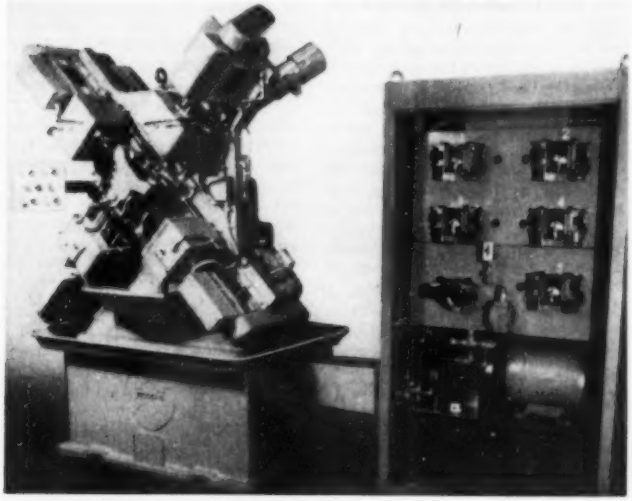
DRILLREAMER

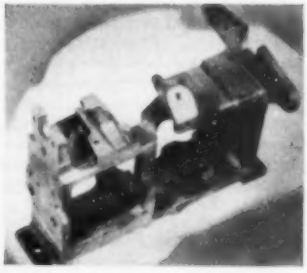
This machine typifies design for limited Canadian production; it is a 3-way unit for drillreaming crown-gear mounting holes in an auto differential case. The cross hole for the differential-gear shaft is also drilled and reamed by the two side units. Five interchangeable magnesium multiple drillheads, attached with only four quick latching bolts, as well as interchangeable inserts in the fixture, make quick changeover possible, so the unit can produce cases for Chevrolet, Pontiac, Olds, Buick, and IH Tractor **(1, 2)**



BORING BOILER SECTIONS

Here is a special boring machine in which it was advisable to allow for a forthcoming model change. The unit rough-bores and taper-reams nipple holes in hot-water boiler sections. Two extra bosses in the boring-head casting will accommodate extra spindles for a contemplated model change, thus avoiding the high cost of replacing the head **(1, 2, 3)**





6-WAY DRILL The CI telephone-switch frame above has a complex pattern of 40 holes, small and close together. It is hydraulically clamped in this 6-way drilling machine, which has additional spindles to accommodate a possible die-cast alternate part with different hole spacing. Here extra spindles were an economical forethought, and upending saves considerable floor space **(1, 2, 4)**

new processes . . . WILL MACHINE

Diamond bort is short—and becoming shorter. Current usage exceeds imports and reclamation by half a million carats. How will we sharpen carbide tools and machine other hard metals and ceramics? Mineral & Metals Advisory Board, National Research Council, called in a panel of experts. Here, in condensed form, is their report, listing new electro-mechanical, electro-chemical, and abrasive processes and their apparent potential. They'll take a lot of development — but here are the fundamentals. Details are in Report MAB-18-M, under contract DA-49-025-sc-83 with Dept. of Defense.

DIAMOND-WHEEL grinding has for some time been the only practical method for shaping and finishing carbide tools and projectile cores. These account for approximately 70% of our diamond bort consumption. At the present time, imports and reclamation of diamond bort are limited; although there may be some increase, these might not be sufficient to produce the tools and military end items in a substantially increased preparedness or mobilization program. In addition, many new military items, which involve hard-to-machine materials, are being developed, and the anticipated rate of production of these is very large.

NEW PROCESSES

Excluding various ramifications of methods employing bonded or coated abrasives, several processes are under development here which might be substitute methods for diamond-wheel grinding or have possibilities for machining and grinding hard-to-machine materials that are badly needed for our preparedness program. These techniques include (1) the electrolytic process, (2) the electro-sparking process, (3) the electro-arcing process, (4) the ultrasonic process, and (5) various combinations of the preceding four.

The Electrolytic Process

Electrolytic grinding is usually performed by a revolving metal disk cathode in close proximity to an anodic workpiece while an electrolyte is applied to the disk and workpiece in the same manner as a coolant to a grinding wheel and work. The method is usable for removing stock from electrically conducting bodies such as metals or metal carbides. It appears especially suited for removing stock from large surfaces, but its applications are limited where very small surfaces need be ground or for drilling small-diameter deep holes.

The electrolytic process utilizes steady dc and a highly conducting electrolyte. Relatively low voltages of less than 25 volts, usually between 16 and 18, are used. It is characterized by low local heating and essentially no consumption of the cathode. In this process, a true electrochemical action takes place in accordance with Faraday's Law. With fixed current density, the rate of stock removal, in terms of volume per unit of time, is proportional to the effective area of the work exposed to the electrolytic action. Cathode-anode spacing and polarization effects appear to be critical factors in the electrolytic process, particularly for shaping or finishing cemented carbides.

The Electro-Sparking Process

In the electro-sparking method, stock is usually removed by making the work one of the electrodes in a properly designed circuit. Rapidly pulsed current (usually oscillatory) of the spark discharge type is passed between the work and the other electrode in a dielectric fluid. The method is used for removing stock from electrically conducting bodies such as metals or metal carbides and is especially suited for forming small-diameter, deep holes of any shape.

The electro-sparking process is characterized by relatively high electrode consumption. Local heating is not experienced under ideal operating conditions. The range of voltage usually employed is between 40 and 300 volts. In a pure electro-sparking process, the electro-discharge is initiated by the voltage across the dielectric. The process is electro-mechanical and not electrochemical (as the electrolytic process). Stock is removed by a sparking action and the metal or metal-carbide particles are carried away suspended in the dielectric fluid. (For details of this process, see *AM*, March 3, '51, p 136.)

The Electro-Arcing Process

Cutting by the electro-arcing process is performed by making the work the anode, with an arc maintained between the work and the cathode. The method usually utilizes pulsating dc with moderately conducting electrolyte such as water-glass solution. It is especially suitable for rapid cutoffs of hard metals and carbides and may be faster than existing cut-off procedures. However, in a pure electro-arcing process, somewhat rough finishes are obtained.

Low voltages of less than 25 volts are usually used. For a pure electro-arcing process, the electro-discharge is initiated by contacting the electrodes, and current is carried by vaporized metal ions. The process is commonly characterized by deposition of some non-conducting film (such as silica) on the work, and high local heating is evidenced with moderate consumption of the cathode. As in electro-sparking, electro-arcing is essentially electro-mechanical in nature, in that the metal or metal carbide is not removed by an electrochemical reaction.

The Ultrasonic Process

As differentiated from the electro-processes, the ultrasonic process does not utilize electric current directly for stock removal. Cutting or stock removal is accomplished by abrasive action at high frequency and low amplitude. Unlike the electro-processes, the ultrasonic technique grinds non-metals or non-electrically conducting bodies as well as electrically

conducting materials and metals.

In the ultrasonic process, the cutting or grinding tool is usually vibrated in the frequency range from 16,000 to 29,000 cycles per second through an amplitude of not more than a few thousandths of an inch. The abrasive, which is usually 280-grit boron carbide, is carried in water to the tool and work Other grit sizes and abrasive compounds, such as aluminum oxide and silicon carbide, may be used, but these do not last as long as boron carbide.

Consumption of this tool occurs during grinding and machining. Included are carbides, osmium alloys, titanium alloys, tungsten, moly, alnico, germanium, diamond, quartz, ferrites, ferroelectric ceramics, aluminum oxide, glass, onyx, sapphire, and boron carbide itself.

Roughing can be done to 0.002 in., finishing to closer tolerances depending upon grit size. Rate of cutting is competitive with other methods—chip breakers can be cut in 30 sec to 2 min with tool cost under 5 cents. Finishes in roughing are about 25 mu-in. rms, but polished surfaces can be obtained with finer abrasives.

The process involves very low stress and no local heating, so there is no cracking, pitting or burnt color and the work is unchanged.

Combination Processes

In addition to these four processes, machines may be devised for effecting combinations of some of the four. For example, the combination of the electrolytic and diamond-wheel grinding has been tested and is being developed. For this combination process, a metal-bonded diamond wheel must be used for the cathode. The diamond particles act as insulating spacers, separating the work from the wheel, and as scrapers.

Machines have been tested and are being designed for effecting machining and grinding by electrolytic and/or electro-arcing actions. The same electrolyte or more than one electrolyte might be used by the same equipment, which will serve for either the electro-arcing or the electrolytic process.

Electro-arcing, electro-sparking, and electrolytic actions might occur simultaneously during a grinding or cutting operation. Machines predominantly operate on the basis of one of the processes, but there may be other process mechanisms superimposed. Superimposition of more than one mechanism or process in a cutting or grinding operation could markedly alter the results obtained.

The ultrasonic technique might be used in combination with one of the electro-processes such as the electrolytic one. However, this has not as yet been tested.

Potential Applications

First consideration is the current use of diamond bort for performing important operations in accordance with present-day practices. These operations involve principally diamond-wheel grinding. In addition, other finishing and forming operations of hard-to-machine materials must be evaluated. Diamond-wheel grinding or some other form of diamond cutting might be suitable for some of these latter items, but if they are to be produced in large quantities, there aren't enough diamonds in the world to do the job because the diamond-bort supply is hardly adequate to perform operations currently under way.

In Table I are eight important machining and grinding operations, which cover the important defense items. They are listed in order of current diamond-bort consumption and account for approximately 74% of the diamond bort consumed in the United States. This tabulation indicates the estimated applicability of the new machining and grinding methods, including diamond-wheel grinding. These applicability ratings are based on current knowledge of methods, and they may change with new developments. The following describes in more detail the potential applications of the new machining and grinding processes as related to each of the eight operations.

Sharpening Single-Point Tools

Single-point tools considered here are made of cemented carbides mounted on a steel shank. Sharpening is usually performed by flat off-hand grinding operations with diamond wheels. This accounts for approximately 30% of the diamond-

table I . . . **IMPORTANT MACHINING AND GRINDING OPERATIONS AND ESTIMATED APPLICABILITY OF METHODS**

Job Item or Operation	Percent Use of Diamond Bort**	APPLICABILITY OF METHODS*				
		Diamond-Wheel Grinding	Electrolytic	Electro-sparking	Electro-arcing	Ultrasonic
1. Sharpening of single-point tools	30	A	B	B***	C	B***
2. Grinding single-point-tool chip breakers	20	A	B	B	C	B
3. Sharpening milling cutters and broaches	15	A	B	B	C	B
4. Grinding projectile cores	5	A	B	B	C	B
5. Shaping and finishing dies	4	A	D	A	D	A
6. Forming of turbine-bucket attachments	—	B	B	B	C	B
7. Rifling of gun barrels	—	B	C	B	C	B
8. Machining and grinding of compressor disks	—	B	B	B	C	B

* A. In use on production scale.
B. Appears applicable; promising but limited experimental data to date.
C. Questionable applicability; not promising but might be developed to be promising.
D. Limited applicability or not applicable; not usable in present state of development.

** Approximate percentage of total diamond bort currently being consumed in the United States. All diamond-wheel grinding consumes about 85% of the bort and the operations considered account for 75%. The remaining 10% is used for a multiplicity of operations.

*** Not applicable for off-hand grinding, but appears applicable for machine grinding.

bort consumption in this country, and as such is the largest single consumer.

The steel shank is usually ground separately with an aluminum-oxide grinding wheel. The effective area usually ground ranges from 0 to ½ sq in., and small depths of metal are removed.

The specifications for as-sharpened single-point tools are not very exacting, but they usually require that no cracks be visible at 200 magnification and that the surface finish be better than 50 mu-in. rms.

If the operation of sharpening single-point tools is limited to flat off-hand grinding, then only the electrolytic method or combinations of the electrolytic method with abrasive grinding appear promising. The process can be an off-hand grinding operation by converting conventional metal-bonded diamond-wheel grinding machines with auxiliary equipment such as a rectifier and an electrolyte pump. Eight conventional grinding machines are now being converted to electrolytic grinding, and these will operate to test the sharpening of single-point tools utilizing a combination of diamond-wheel scraping and electrolytic action. The electrolytic method produces no cracks and meets the finish specifications at all speeds of metal removal. Commercial performance and cost of the operation are indefinite and must yet be established.

Further Development Needed

If sharpening single-point tools is not limited to flat off-hand grinding, then the electro-sparking technique and the ultrasonic technique appear applicable, as shown in Table I. However, neither is at the present time adaptable to off-hand grinding, but can be mechanized in machine grinding. Electro-sparking methods have questionable cutting time for sharpening single-point tools. The equipment is somewhat more expensive than for the other methods and operating cost is dependent on rate of cutting and finish desired. For finishes of 10 to 20 mu-in. rms, the electro-sparking techniques become more expensive. No machines are at present available, and ordinarily about one year would be required for production. The ultrasonic technique produces no cracks or damage and meets the finish specifications required for single-point tools. However, the sharpness of the edges as produced by the ultrasonic method have yet to be tested. Sixteen ultrasonic machines are currently available for further test work on machine grinding of single-point tools and similar items.

The electro-arcing process has been tested principally as a cut-off method, but it produces rough finishes that do not meet specifications for single-point tools. However, experimental work is planned on machines designed to operate on a combination of electro-arcing and electrolytic actions, and might prove promising.

Grinding Chip Breakers

Some carbide single-point tools require chip-breaker grooves back of the cutting edge. Grinding these chip breakers accounts for approximately 20% of the currently consumed diamond bort. The conventional method for grinding chip breakers is with diamond grinding wheels.

Grinding chip breakers requires machine grinding. The form is through shaped, and the grinding is for only small depths. Appreciably smaller effective grinding surface areas are present for forming chip breakers than for sharpening single-point tools, being in the order of from 0 to 0.2 sq in. The same specifications hold on chip breakers as for single-point tools. There must be sharp edges, no cracks at 200 magnification, and better than a 50 mu-in. rms finish.

Of the new processes, the ultrasonic technique appears especially applicable. This technique performs and produces a finished article in much the same manner as described for sharpening single-point tools, but the potential cost of grinding chip breakers appears better than for sharpening single-point tools by the ultrasonic process. In addition, a special-shape chip-breaker groove might be inserted inexpensively by the ultrasonic technique. However, the sharp edges have yet to be tested.

The electrolytic and electro-sparking processes appear applicable to grinding chip breakers. The electrolytic method meets the finish specifications, and as in single-point tool sharpening, conventional grinding machines might be converted. But because grinding chip breakers is a machine-grinding operation, the conversion will be more extensive. At the present time, one machine is being converted to operate by a combination electrolytic and diamond-wheel grinding. The rate of metal removal by the electrolytic process for forming chip breakers is not as favorable as for sharpening single-point tools because of smaller effective grinding areas involved. The electro-sparking technique can be mechanized for forming chip breakers, but the cutting time is questionable, the cost of the operation is dependent on the rate of cutting, and the techniques is more expensive for the better finishes in the range between 10 and 20 mu-in. rms. Although at least seven electro-sparking type machines are now available, about one year will be required for construction of machines for adaptation.

The electro-arcing process appears to be of questionable applicability for grinding chip breakers because the finish is rough and damage is possible. However, a combination of the electro-arcing process with the electrolytic process in one machine may prove promising.

Sharpening Milling Cutters and Broaches

Milling cutters or broaches are made with sintered carbide teeth and consist, in effect, of several single-point tools mounted in a body. Each tooth of the milling cutter or broach is usually ground separately, using diamond grinding wheels in a special setup. The teeth are ground to a small depth, and the effective area of grinding is between 0 and ½ sq in. Sharpening of milling cutters and broaches accounts for approximately 15% of the total diamond bort consumed in this country.

Specifications required on as-sharpened milling cutters and broaches are similar to those for as-sharpened single-point tools, ie, no cracks must be visible at 200 magnification, sharp edges must be effected, and the finish must be better than 50 mu-in. rms.

Because cutters are machine ground, diamond-wheel grinding is somewhat more costly than for sharpening single-point tools. A cup wheel is usually used.

Table I shows that the electrolytic, electro-sparking, and ultrasonic processes appear applicable, but there are no machines available for testing. The electro-arcing process is of questionable applicability here. For each of the new methods, the conclusions derived on sharpening single-point tools are expected to hold for sharpening milling cutters and broaches.

Grinding Projectile Cores

Projectile cores are made of cemented carbides weighing from 4 to 12 lb, and the grinding operations

are usually flat base or ogive type. Unlike tool sharpening, the effective area of grinding is large, namely, between 2 and 10 sq in. Grinding of projectile cores accounts for approximately 5% of the diamond-bort consumption in this country.

All of the new methods (with the exception of the electro-arcing process) appear applicable or promising, but very little, if any, experimental work has been done. If cemented-carbide projectile cores are to be produced in much larger quantities, then these new processes should be tested for this application because there may not be sufficient diamond bort to do the job.

Shaping and Finishing Dies

Dies and cemented carbides include wire-drawing, blanking, and punching dies. Approximately 4% of the total diamond-bort consumption is used on this job.

Table I shows that, in addition to diamond-wheel grinding, the electro-sparking process and the ultrasonic process are in commercial use. There are currently six mechanized electro-sparking machines shaping and finishing dies. The equipment is somewhat expensive, and the cost is dependent on the rate of cutting and the finish desired. The ultrasonic technique has 16 machines in operation and incurs no cracks or damage to the finished dies. Both the ultrasonic and the electro-sparking processes are used for all but the final lapping, and they are more versatile than diamond-wheel grinding. Economics on these processes appear satisfactory because they are in competition with diamond-wheel grinding. For producing shaped holes, these techniques are more suitable than diamond-wheel grinding.

The electrolytic method and the electro-arcing method appear to be of limited applicability or are not applicable for shaping and finishing dies.

Forming Turbine-Bucket Attachments

Turbine-bucket attachments are usually made of nickel-cobalt super alloys or cemented carbides of intricate shapes with up to 2 sq in. of shaping area. Stock removal is from light to heavy, from 0.05 to ½ in. The surface finish must be less than 25 mu-in. rms, tolerances are as close as 0.0003 in., and shaping must be very close. At the present time, alloy types are ground by such means as crush-form grinding, using aluminum-oxide wheels. For sintered carbides, such as cemented titanium carbide, no method for quantity production is, as yet, established. Diamond form grinding does not appear promising because it is too slow and too expensive. If the number of turbine blades required is in the hundreds of thousands per month, forming time required per attachment must be only a few minutes.

The electro-sparking, ultrasonic, and electrolytic techniques appear promising, at least for part of the operations. The electro-arcing process appears of questionable applicability because it cannot meet finish and tolerance specifications.

Rifling of Gun Barrels

In the event of much increased production of machine guns, faster and better methods for machining and grinding will be very helpful, and the new processes may find their applications in rifling hard-to-machine materials used in gun barrels or gun-barrel liners.

As shown in Table I the electro-sparking and ultrasonic techniques appear applicable. The electrolytic and electro-arcing processes are of questionable applicability.

Machining and Grinding of Compressor Disks

There is considerable research and development work under way to utilize high-strength titanium alloys (more than 125,000 psi) in jet-engine components, particularly for compressor disks. However, there has been considerable difficulty experienced in machining and grinding these titanium alloys by conventional methods. Lathe tools, for example, seize and wear rapidly, and aluminum-oxide grinding wheels are consumed very fast. Therefore, conventional machining and grinding operations are slowed down considerably.

Diamond-wheel grinding is applicable, may be too expensive and slow. The new processes, with the possible exception of the electro-arcing process, appear applicable and promising. The electrolytic process in particular appears especially applicable.

CONCLUSIONS

Most of the new processes and the combinations of them appear promising. Performance and costs for these new processes are not as yet well established.

The electrolytic process appears very promissing as a means for flat off-hand grinding in sharpening single-point tools. As this application is the largest single consumer of diamond-bort, rapid development offers possibilities for substantial relief of diamond bort. Additional experimental work must be completed before present diamond-wheel machines can be converted and ready for mass production.

The second most prolific consumer of diamond bort is in grinding chip breakers. The ultrasonic technique appears to be adaptable for this. Additional experimental work is necessary properly to appraise the method.

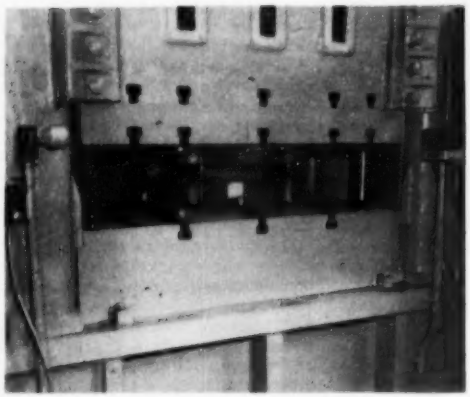
The sharpening of milling cutters and broaches and the grinding of projectile cores account for a substantial consumption of diamond bort. The electrolytic, electro-sparking, ultrasonic processes, and combinations of them, look like possibilities for these applications; but experimental programs in these fields have yet to be started.

On the forming of cemented-carbide turbine-bucket attachments and machining and grinding of titanium compressor disks, no commercial methods have been established, and it may be necessary to develop some of the new processes at a very rapid rate to meet the demands of possible increased production. The electro-sparking and ultrasonic processes appear applicable for forming turbine-bucket attachments and rifling of gun barrels; the electrolytic process appears promising for machining and grinding of compressor disks.

None of the new processes are in actual commercial use except for shaping and finishing dies. However, a limited number of machines, based on these new processes, are becoming available for practical test work. Fairly extensive performance tests should not only be made on the machines but also on the tools themselves in order adequately to establish them as production units. At the same time, research and development on machine improvements and on learning more fundamentals should proceed in a more intensified manner. The performance tests might best be done in production shops—eventually they must be done there. However, it may be worthwhile to design special programs for accelerated performance tests to exploit the methods as rapidly as possible. Performance tests should be carried out mainly by industry, which has the real need for these new processes.

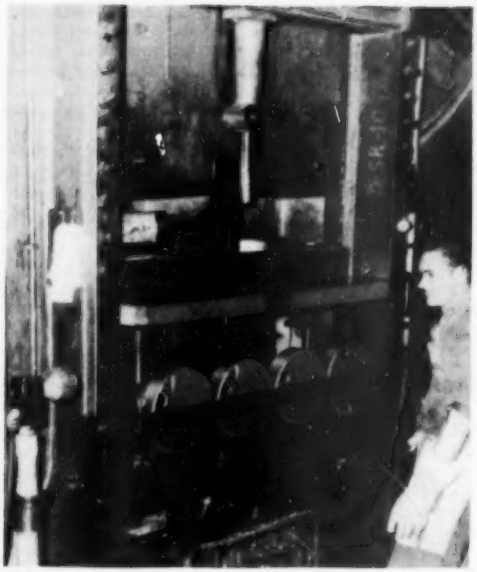
SHOP SHOTS

AT CANADIAN GENERAL ELECTRIC

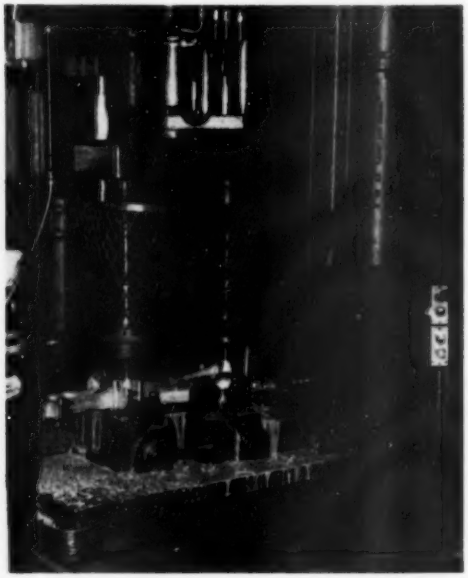


Electric eye guards the die area of all large presses and stops them instantly if any part of the operator's body is close enough to interrupt the light beam. Note that the rear opening is also guarded with a fixed guard

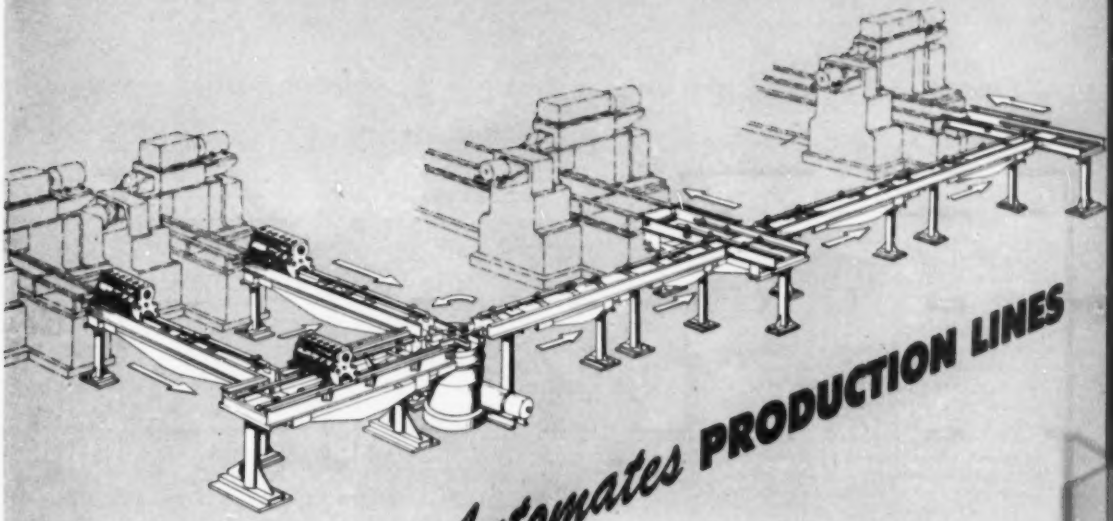
Four coffee counters in various parts of the plant are open for 10-min periods, morning and afternoon, and are available to all employees. Experience indicates that production does not suffer, and there is no tendency for employees to gather in large groups for "tea parties"



Piercing and extruding die for holes in the edge of compressor housings. This is a four-stage setup in which the punches are carried on a plate which overhangs the main ram, and the work is located on a die attached to the side of the bolster



Multi-spindle machine for washing-machine gear cases has two vertical heads, one horizontal head (right) and one horizontal head (rear). In a single operation, it bores and spotfaces three holes and bores and chamfers one hole



HOW FORD *Automates* PRODUCTION LINES

BY RUPERT LE GRAND, ASSOCIATE EDITOR

It can be proved that big dividends are earned by minimizing drudgery in mass production.

Despite Metalworking's progress in building and using the high-speed machine and the transfer machine, operators still generally handle loading, cycle starting and unloading. The operator paces output.

This seeming inability to create the automatic production line merely prolongs the failure to realize the true potential of modern machine tools and metal-removal rates. Yet the step from semi-automatic lines to full-automatic lines is not tremendously difficult.

The Ford Motor Company, pioneer of many manufacturing firsts, has extended automation from its original use on press lines (AM — Oct. 21, 1948, p. 107) to many machining lines for its new engines. Important gains have been realized in respect to the number of pieces that can be produced hourly and in savings of direct labor.

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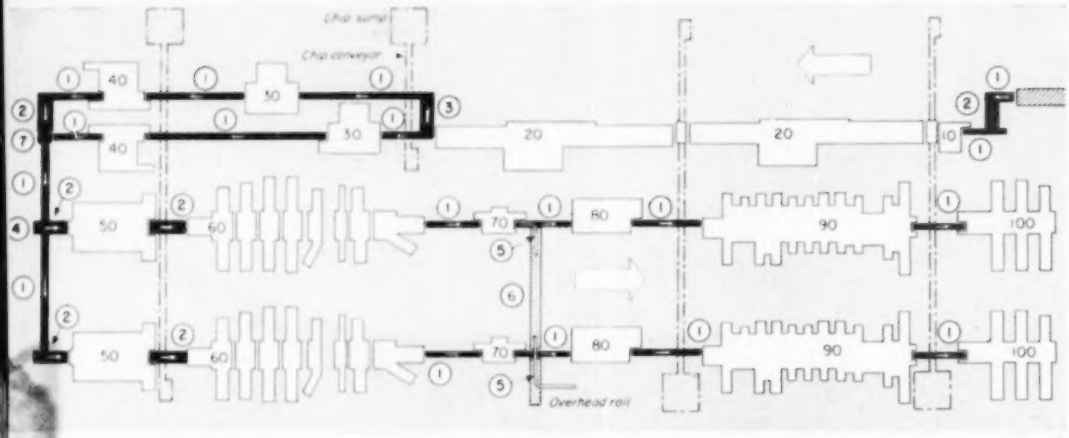


Cylinder Blocks Processed Automatically

By means of a fully automated system, cylinder blocks move into and out of machines automatically on Ford production lines. This amazing spectacle, duplicated nowhere else in the automotive industry, is remarkable because automation really got its start at Ford in 1947. For in the Spring of that year, a separate department was set up to develop systems that might solve problems in connection with transfer of parts between machines.

In 1948, we reported to you how automation enabled the establishment of automatic press lines. Since then, successes with automation have so greatly outweighed the failures that there are many groups within the Ford organization working upon how to load and unload machines without manual effort.

The original idea back of automation was not to "save" labor for that reason alone. In the postwar boom, Ford had to conserve labor for jobs where human skill is needed, and it had to get more pieces through existing machines in a shift. One way out was to substitute mechanical loaders.

Since that idea was conceived, Ford has installed, or planned, literally thousands of automation devices. The cylinder block line at Ford's new Cleveland Engine plant has 80 automation devices alone. The other parts lines in this plant are automated. So are new engine lines at Dearborn: likewise the press lines in Ford's new pressed-steel plant at Buffalo. Engineering ingenuity can seemingly automate anything — stampings, castings, forgings, drawn products, even windshield glass.

What the sociological effect of automation will be is a matter of point of view. It is undeniable that automatic lines do not require direct labor for loading, unloading and inspection operations as is still common on many highly developed, but semi-automatic, production setups. Yet in any automated plant, even Ford's Cleveland Engine Plant, there are many jobs. People are required for assembly and testing work. The automation devices and machines require

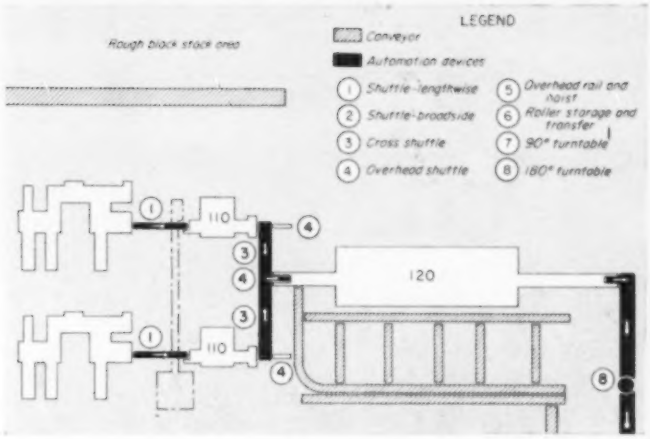
PARTS MADE ON AUTOMATED PRODUCTION LINES

CLEVELAND

Cylinder blocks
Cylinder heads
Connecting-rod cap
Camshaft
Crankshaft
Bearing-caps, main
Rocker-arm shaft
Oil pan
Piston
Flywheel housing

DEARBORN

Cylinder blocks
Cylinder heads
Tappets
Rocker-arm shafts
Exhaust valves
Curved windshield
Ring gears
Piston
Push rods
Gas tanks
Flywheel housing



Partial layout of cylinder block line for the Ford overhead-valve six. Location: new Cleveland Engine plant. Rated output: Combined capacity of this line and other block lines is 290 finished blocks per hr. This plant has 850,000 sq ft of productive floorspace. About 4500 people will work there in two shifts. Automation of the various parts lines will bring about a significant increase in production as compared to other modern installations. No more floorspace is required to equip an engine plant with automation than to equip it conventionally

maintenance. Tool setting is an important function.

By pioneering the assembly line, Ford reduced the cost of automobiles. More people were made able to buy and enjoy them. The assembly line really transformed the automobile business into an industry.

In the current era of high-cost production, even with modern machines and plants, the chances of bringing down costs without automation would appear remote. But if automation is employed, the possibility exists for creating goods and services at prices that the public can afford. The true potential output of modern machines and cutting materials can be realized. A striking example is the automated cylinder-block line at Ford's new Cleveland Engine plant. This line has a rated capacity more than double that of the best modern lines that operate semi-automatically.

Two facts are evident from this comparison. First, the lower output plant is at a serious cost disadvantage because it is employing labor on jobs where labor is really not needed. Second, it is not getting the full potential out of modern machine tools. In many particulars, the machines in the two plants are undoubtedly on a par from a basic design standpoint. But the machines in the lower-output plant are not speeded up as much as the Ford machines, because men simply cannot be expected to load and unload them that fast—certainly, not hour after hour.

Analysis for Automation

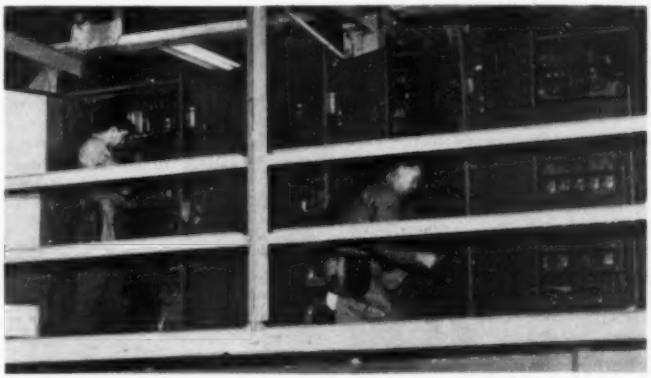
Successful automation depends upon following a careful procedure. Automation engineers should logically work within the framework of the plant layout department, but they must maintain close liaison with manufacturing engineering, tool engineering, the production executives that will be affected, and the purchasing department. A brief outline of the steps leading to successful automation is:

1. Study parts for automation possibilities.

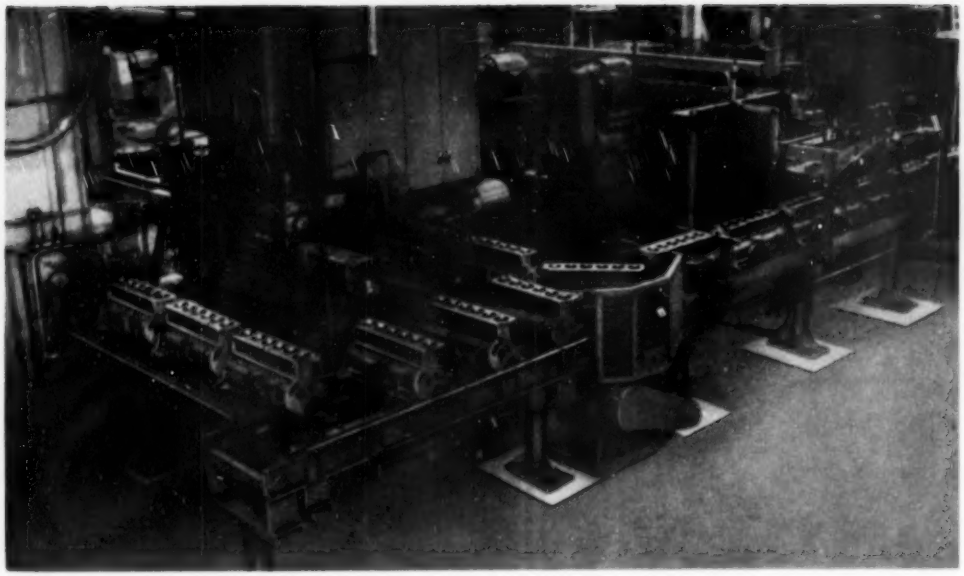
2. Consult with plant layout and methods engineers.

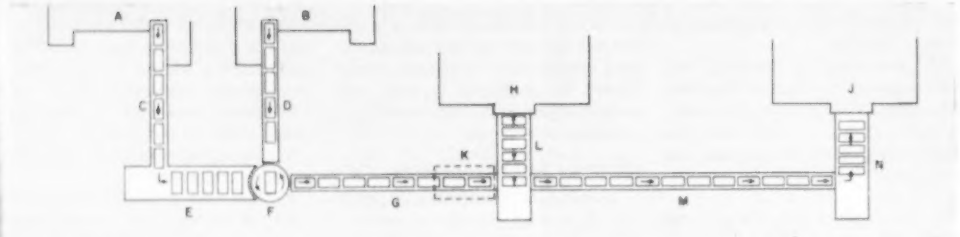
3. Make cost studies to determine potential savings, and weigh these savings against normal handling methods.

4. Produce layouts that show spacing increments, distances between machines, and where float should be introduced for critical



Control panels for machine tools are normally placed on balconies. It is essential that they incorporate relays for the interlocking of the automation equipment





Heart of the Automation System—Ford engineers refer to the above block line as the heart of the system. This is how the system works:

Blocks are pulled out of boring machines *A* and *B* by lengthwise shuttles *C* and *D* at a combined frequency of 142 to 160 blocks per hr. Cycling of *E* takes priority over *D* to avoid jams at rotation fixture *F*. Cross-shuttle *E* is nominally under control of the master limit switch of shuttle *C* and will take a piece away and put one on the rotation fixture. But a time-delay switch is connected into the circuit. If shuttle *D* is ready to take a block out of machine *B* and deliver one to the rotation fixture, it is permitted to do so after a 2½- to 3-sec. delay, provided shuttle *E* has not signaled. This is known as "singular selective sequence loading" by Ford automation experts.

Of the two face milling machines *H* and *J*, machine *J* has priority, since it is served by the longest line and provides more float. There would be interference if shuttle *G* could stroke to the "out" position of broadside shuttle *L*. Hence, overhead shuttle *K* delivers a block onto a pad spanning the two shuttle bars of shuttle *L*. If the line to machine *J* is not full, shuttle *M* takes the block. If it is full or inoperative, the broadside shuttle takes the block, if it is able, and returns to the out position. If both machines are occupied or shut down, and all automation feed lines are full, an interlock will delay preceding machining lines and/or line feeds. This system is known as "dual selective sequence loading"

operations. Then write preliminary specifications.

5. Get proposals from vendors—if possible from people who are willing to take full responsibility for both design, building, installation and tryout.

6. Let contracts for automation after certified prints have been received for dimensions of machines, particularly over-all length, throat depth, and after department layout is completed.

7. Check location of machines when installed, to see that they comply with original data from which designs were taken.

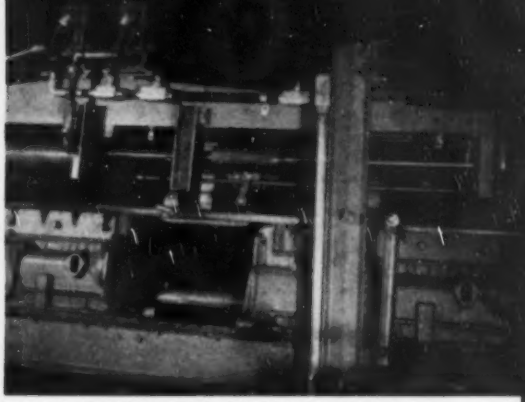
And above all remember that:

1. The time required from the inception of an automated line to full production hinges on the part's size, production rate and the facilities available.

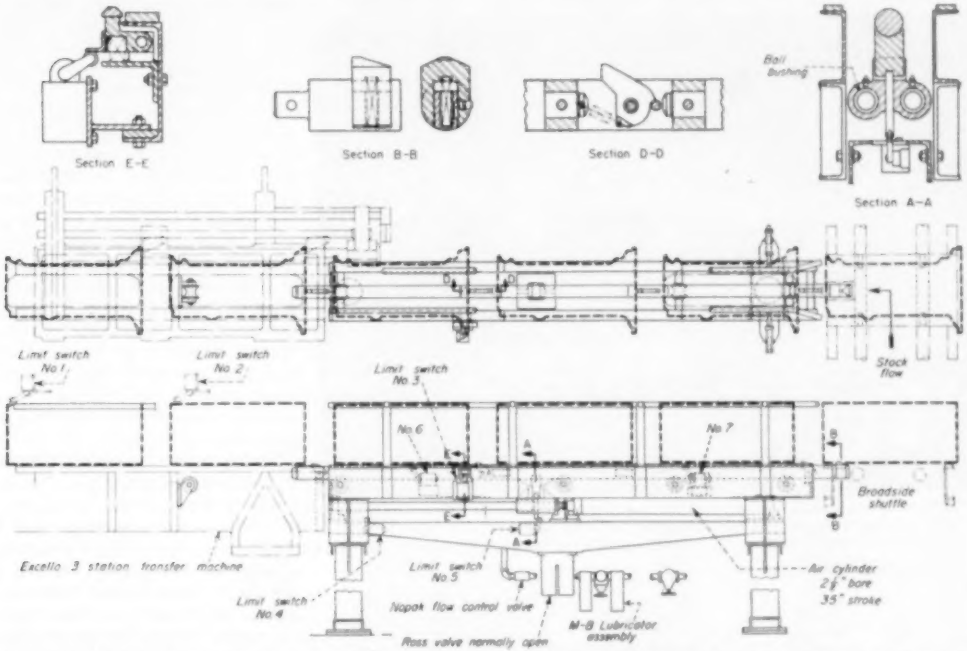
2. Explain to equipment builders what you are trying to do, and why it is necessary to have certain dimensional and electrical data.

3. Remember that large control panels will be needed for the automation equipment, and that these panels must be placed at strategic locations at the machines. It is necessary to be able to control the devices manually from the panel, in event of breakdowns and during testing.

4. Strive to incorporate adequate chip handling in the program. Nothing can curse a high-produc-



Overhead transfer shuttle is necessary to prevent interference of shuttle bars, where automation branches to two Sundstrand face mills, Op. 50. Normally, the lengthwise shuttle at right takes a block deposited on center space by overhead shuttle. But if the priority line is filled, the broadside shuttle operates



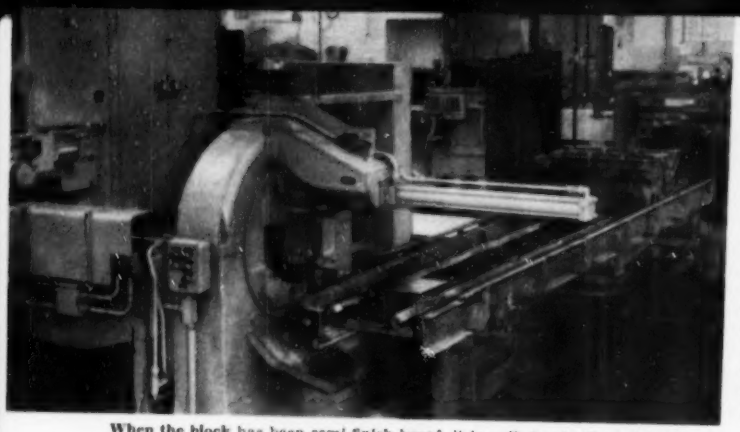
Lengthwise shuttle takes work from broadside shuttle at right and delivers it to position in Ex-Cell-O where the machines' transfer bars can move it into the machining stations two blocks at a time. If limit switch LS 3 is depressed by a piece of work and LS 2 or LS 1 signals that the station is empty, the shuttle bar moves left to unload the broadside shuttle. The latter must be at rest. The block on LS 3 is delivered to LS 2 and the shuttle bar returns to rest at LS 5. LS 4 and LS 5 control the length of stroke. Pushing speed is about 7 in. per sec

tion, automatic line more than frequent stoppages to dig out chips.

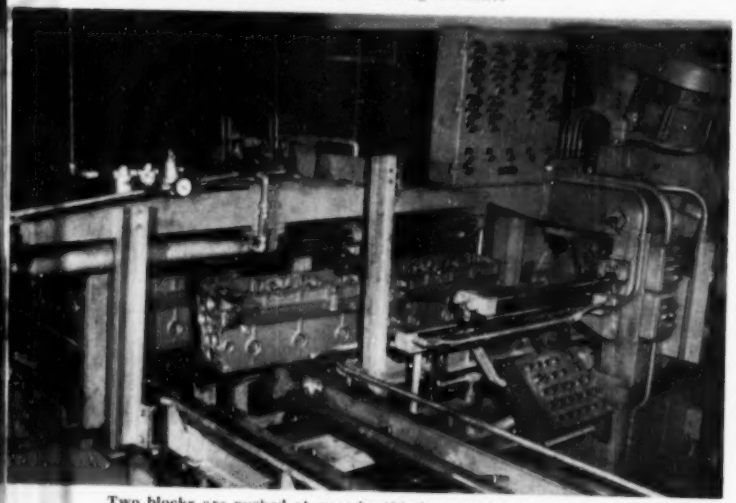
5. If machining cast iron, remember that cast-iron dust is generated and that this fine substance can get into even the best electrical controls (built to JIC standards) to cause shorts and production interruptions. All electrical and mechanical equipment should be adequately protected by dustproof inclosures, if necessary, against these ferrous particles. Ford also has installed the most modern type of chip-removal system in the machining areas.

Machine-Tool Requirements — Some machine tools are not designed so automation can be applied readily. Sometimes, the loading and unloading stations must be removed by "notching" the beds, so the shuttles can reach in to supply a part to the machine's transfer mechanism and to remove a finished piece. In other cases, loading and unloading stations are knee castings bolted to the machine bed. If these castings are re-moved, automation can convey

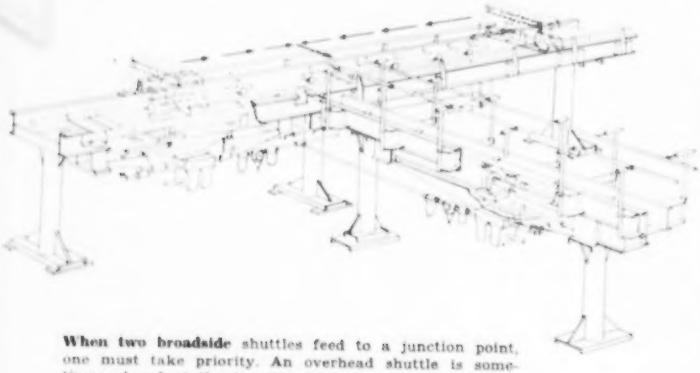
double that of any other similar



When the block has been semi-finish bored, it is pulled onto the automation by on overhead hydraulic cylinder that is part of the machine. Broadside shuttles take blocks to a central junction point. Here, an overhead shuttle pushes blocks onto a powered roller conveyor serving a washer



Two blocks are pushed at once by this long-stroke shuttle. This arrangement is necessary in order to unload the first block from the rest station and to push the second block to a position where it can be handled by the transfer bars in the machine tool



When two broadside shuttles feed to a junction point, one must take priority. An overhead shuttle is sometimes placed at the junction point to serve the lengthwise take-away shuttle, to avoid bar interference

blocks into and out of areas within control of the machine's indexing transfer mechanism (usually index bars with dogs).

Ford found it desirable to purchase transfer machines with inspection and blow-out stations. These check existence of holes (and clean them out) before tapping to avoid tap breakage and shut downs. Also, machine beds are cored so that chips fall directly into underfloor vibrating-feed chip conveyors.

Automation Design — The designer of automation must be familiar with materials-handling methods, machine design, machine-tool and plant equipment design, and production problems. He should possess something of the Rube Goldberg instinct.

It is not practical to detail automation in a rigid manner, especially the length. For shuttle-type jobs, it is best to await certified machine drawings, because transfer and similar equipment tends to grow in length from conception to completed machine, by reason of engineering changes. And when the machines are installed, measure the spacing, and have the automation corrected in the vendor's shop. For conveyor-type installations, design so that splice plates or connections can be welded on to suit field conditions.

Means must be devised to keep chutes or load stations at machines properly filled. If the automation device is a chain conveyor, use a flipper plate that normally rests in a pocket in the guides. Then, if a low-level switch opens, the flipper swings out to pick-off pieces from the chain. When the guides are again filled, the high-level switch de-energizes the flipper solenoid.

Economic Factors — Like all equipment, automation devices have risen in cost since Ford started to employ them. A rather simple shuttle may now cost $6,000 to $7,000. Still the investment to automate a production line is worthwhile. A new engine is generally planned to have a production life of ten years. Certainly, the cost of automation can be amortized within a reasonable period, considering the fact that output of the cylinder-block line alone is

double that of any other similar line existing elsewhere in the automobile industry. Besides, the very significant production increase from that line could not have been obtained in any other way.

Not all automation is as costly as one finds on an engine line or a press line. For smaller parts, as will be seen later, automation can be built around chain conveyors, hoppers, chutes, and metering devices.

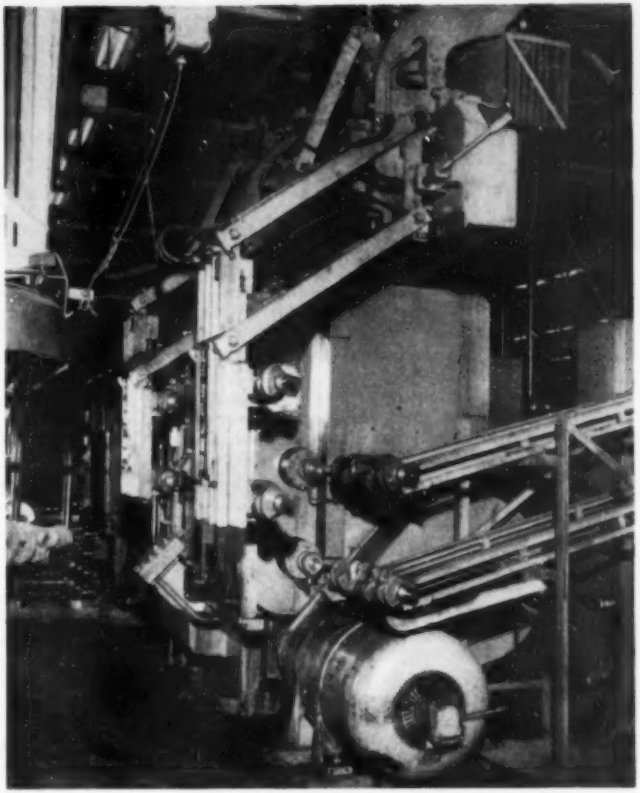
Effects on Quality — Less scrap and fewer rejects have always been objectives of production personnel. Automation definitely reduces damage to parts. They are protected by guide rails or other means affixed to the automation equipment, and the chances of falling on the floor are practically nil. They are not jostled together in a tote box, so highly finished surfaces become scratched.

Maintenance Costs — It is undeniable that maintenance costs are increased. When transfer machines were first introduced, it was announced that possibly 90% of the operators for an equivalent line of general-purpose machines had been displaced. However, little was said about the need for more maintenance personnel and tool setters. Sometimes, the actual manpower savings amounted to only 50%, and a large percentage of the remaining personnel were paid higher rates.

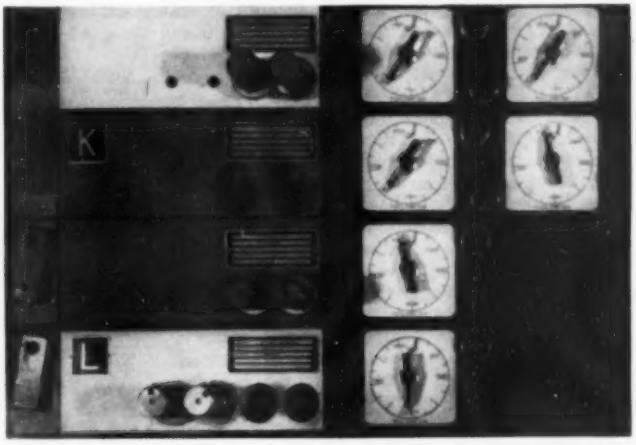
If a department is nearly 100% automatic, the breakdown of even the smallest element can shut down the entire line, when the float is worked off. True, men can be brought in and the work loaded onto operative automation devices and processed through machines, if the shutdown is likely to endure for an extended period. Such measures are expensive.

However, as the user of automation gets experience and skill, the details of automation systems are simplified, the devices are made more sturdy, and preventive maintenance is practiced. In time, these factors reduce maintenance costs on the automation devices, and the planned benefits are obtained to an even greater degree.

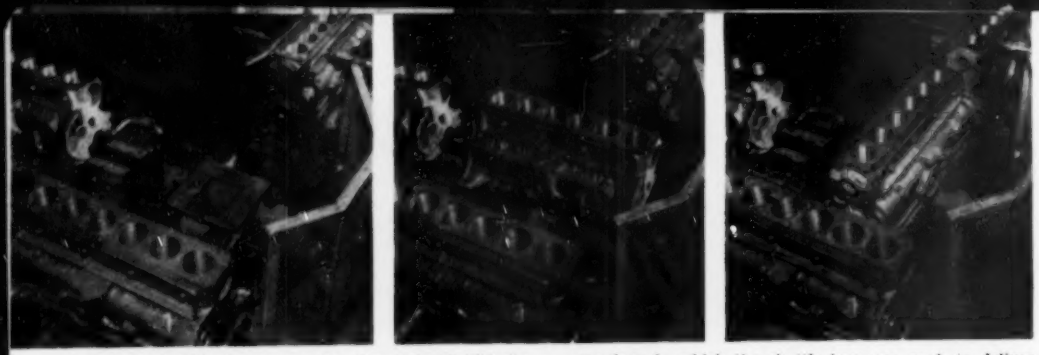
Large castings like cylinder blocks and cylinder heads are automated by means of shuttles. These



Crankshafts are automated too. Here the double spindle lathe has been equipped by the manufacturer with overhead arms that unload the two spindles, place the shafts on automation and then come back to foreground for new pair



Toolometers signal when tools on transfer machine have reached practical wear limit. A red band on "clock face" indicates the high limit according to tests; and a black line shows the safe value. Set hand is placed at safe figure. When the sweep hand, started at zero, touches the set hand, contact is made and a red light goes on, indicating a tool change is necessary



Turntable installation between Op. 40 and Op. 50. This device always indexes 90° counterclockwise. The broadside shuttle (foreground) takes priority over the lengthwise shuttle at left. *Left*—Open turntable shows the clearance openings in which the shuttle bars can push to deliver block. *Center*—Block on broadside shuttle has been delivered to turntable. *Right*—Block after indexing and in position for removal by shuttle at rear

are air-operated devices with guides at machine-fixture height. In operation, the shuttle traverses a bar into the discharge throat of the preceding machine. On the return stroke, spring-loaded fingers spaced along the bar not only pull out the finished piece, but move all of the other castings on the guides through a predetermined distance. If the automation device is full of work, a piece is delivered to the succeeding machine, so that transfer equipment within the machine can move the block through the various machining stations.

Appropriate relays are wired into the machine-tool panel. A push cannot take place unless the succeeding machine is ready for the piece. A limit switch in the shuttle replaces the usual cycle button.

By means of shuttles and turntables, either 90°, 180°, or both turning and rolling-over type, rectangular flow patterns are achieved. No sacrifice of adequate float between critical operations or adequate spacing of machines is noted when shuttles are employed.

Types of Shuttles — There are really only three types of shuttles: (1) length-wise—to push blocks lengthwise with one bar, (2) broadside—to push parts broadside with two shuttle bars, and (3) overhead—to push either lengthwise or broadside as requirements dictate. The overhead shuttle is usually avoided, unless it is impossible to use lengthwise and broadside shuttles at a junction point without interference. Cross shuttles are really broadside shuttles. They take pieces and divert them to a second line, when two machines are needed on an operation.

Construction of Shuttles — Features of shuttles have been largely standardized. First, the framework is structural steel. Over-all length is a function of machine spacing and float requirements. But spacing of the fingers in the shuttle bars is related to workpiece length. For example, the block length is 27⅝ in. In the shuttle sketched, spacing of the fingers is 35 in. and the stroke is 35 in. Upon return of the bar to rest position, the fingers are backed away from the workpiece.

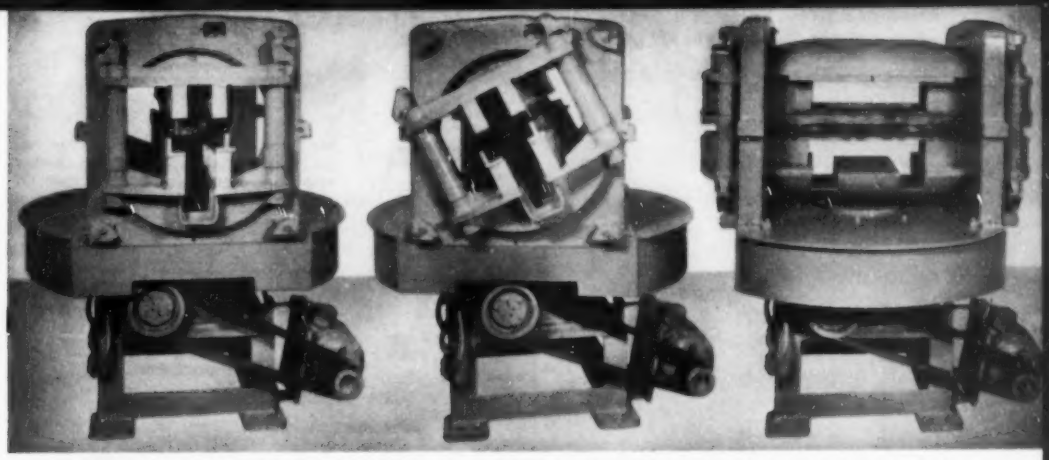
Shuttle bars are always 2½ in. dia, but cylinders are used in three lengths and three diameters. The power unit is standardized. It incorporates a yoke that rides on two stationary guide bars, to prevent binding. The yoke is fastened to the shuttle bar, and the bar is supported by rollers. Construction of the saddle or yoke is such that a cylinder with a packing gland can be used. Repair of the gland, or tightening, is relatively simple.

Speed Control — Pushing speed of shuttle bars is controlled by flow-control valves installed in the compressed air lines to the power cylinder. It is undesirable, of course, that the block continue movement after the shuttle stops pushing. Hence, a pushing speed of about 7 in. per sec is used.

Electrical Control — A plunger with a mushroom or umbrella-shaped head is located at the last station of the shuttle bar. When a block is delivered to this position, the plunger is depressed, causing a limit switch to be actuated. Now the shuttle will not stroke out again to pick up a block from the preceding machine tool or automation device, until relays at the loading station of the following machine indicate that a block may be received.

A bleeder switch allows all blocks to be gotten off the shuttle if the preceding machine has shut down. This device will work until every block is off the shuttle.

Heart of the turntable is this Hautau-Turndex unit. This device will index from 2 to 36 parts of a circle in a time cycle per index of ½ to 2 sec. Maximum weight of work and fixture that can be accommodated is 2700 lb



Compound turntable installed in the cylinder head line is loaded lengthwise. As the table turns 180° to orient the part with the machine centerline, the fixture is clamped. Then the fixture turns 90° about center so that the contact face and valve rocker cavity holes are horizontal for machining in a high-production unit

Limit switches under the power unit control the forward and reverse movements of the air cylinder.

Other limit switches may be applied according to specific circumstances, as say when an overhead shuttle works in conjunction with a lengthwise shuttle.

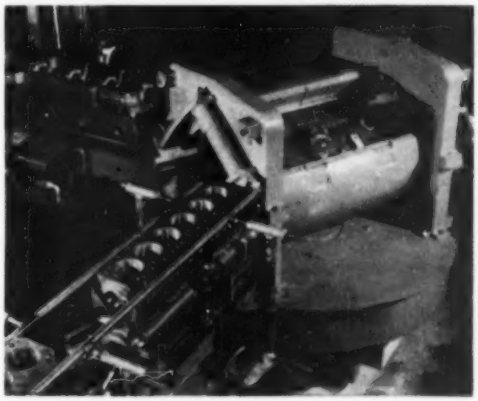
If a turntable is being used, it is obvious that limit switches must prevent rotation while the shuttle bars are within clearance slots in the turntable.

In other words, the electrical control requirements must be worked out for each case. However, electrical components built to JIC standards give reliable service.

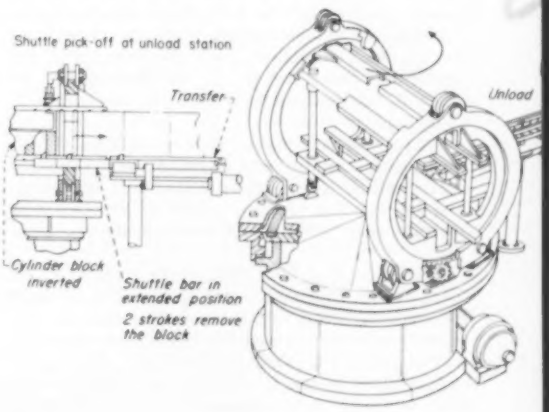
Turntables — The Hautau-Turndex unit provides the means of turning blocks 90° or 180°, and even rolling them over as well as turning 90° or 180°. In the case of the cylinder head, the part is loaded lengthwise into a cradle. As the table turns 180° horizontally, the cradle tips the work 90° vertically so valve guide holes can be machined.

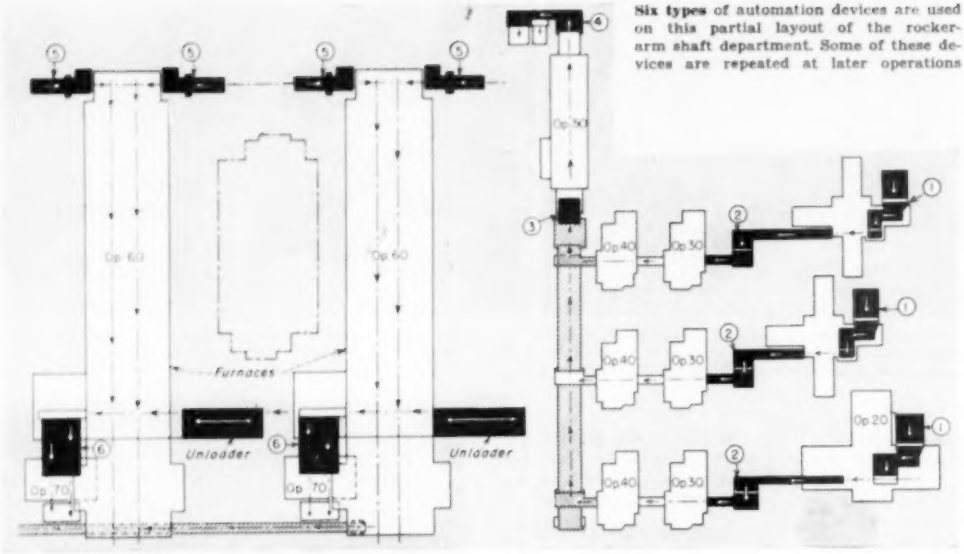
The above unit is approximately 25 in. in dia by 15 in. high in the size capable of handling a work and fixture load of 2700 lb. It is placed on a stand to bring the table or fixture bed to the machine or shuttle height. Power is supplied by a 1-hp motor. Indexing time can be varied between ½ to 2 sec, which is ample under the circumstances and provides a shockless index of the work. An accurate stop is always secured, and that is why the unit has been incorporated into highly precise, special-purpose machine tools for indexing purposes.

If roll-over of the block is involved, a cradle is mounted on the indexing unit. Suppose a shuttle has delivered a block to the cradle. As the table starts to index say 90° horizontally, the part is clamped. Meanwhile a series of gears driven by the indexing unit cause the cradle to rotate 180° vertically. As the table comes to a stop, the work is automatically unclamped. And a limit switch is thrown to instruct the following shuttle to advance its shuttle bar and pull out the block.



If the machine does not have a roll-over fixture, it is necessary to provide one in the automation line. The designer's original sketch below contemplated rolling over the block 180° in a vertical plane and turning it 90° in a horizontal plane. As the table comes to rest, the part is unclamped and a limit switch signals the following shuttle to take the part away when ready. Above the completed device is shown as actually installed in the line





Six types of automation devices are used on this partial layout of the rocker-arm shaft department. Some of these devices are repeated at later operations

Conveyors Automate Rocker-Arm Shafts

Ford's Cleveland plant is set up to produce all rocker-arm shafts needed for the Ford overhead-valve six. Huge daily requirements for rocker-arm shafts dictate the installation of the most efficient methods for bulk handling between machines. The Anchor Steel and Conveyor Co., Dearborn, Mich., was responsible for design, fabrication and erection of the rocker-arm shaft automation.

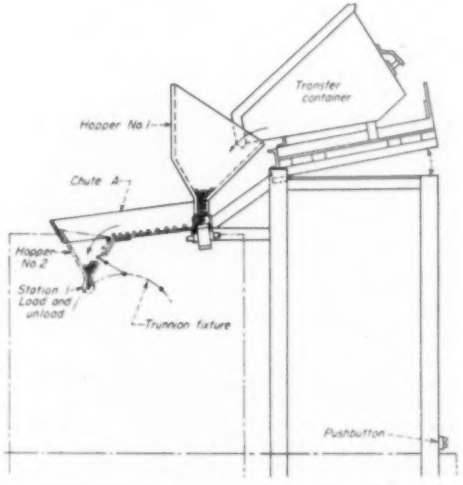
The problem is to make two lengths of shaft, 14 and 27 in. by 0.870 in. dia, in the most economical manner. One line of machine tools process the Ford shaft; two lines the Mercury shaft. But for carburizing, one furnace is employed, and at washing stations, only one washer is used. Also, one spin-quench machine handles both shafts simultaneously.

Camber on hardened shafts must not exceed 0.005 in. to avoid excessive finish-grinding costs. The problem is therefore one of transferring the hot shaft to the spin-quench rolls in an extremely short time interval.

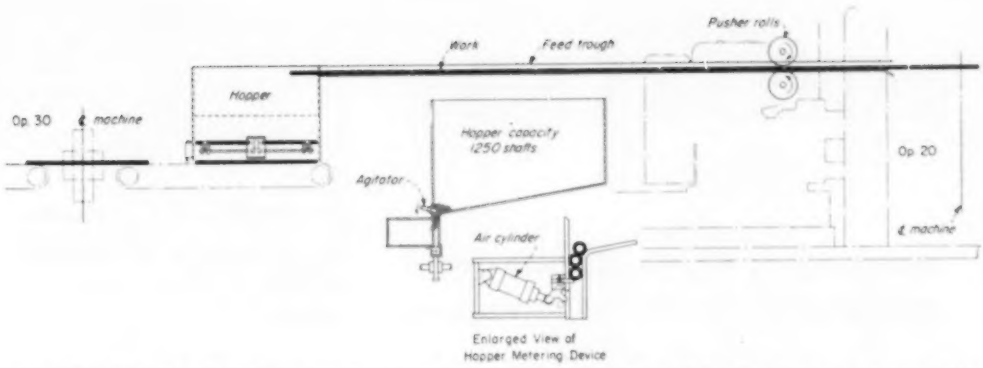
To tie this department into what is practically an automatic entity, Ford engineers have combined special chain conveyors, standard belt conveyors, and feeding and ejecting chutes as supplied with machine tools. Only two operations are not automated.

In the first case, SAE 1040 tubing is cut to length —out of the department—and delivered in specially designed containers by lift truck. This specially designed container (1) becomes the hopper when deposited (tilted) at machine (Oper. 20). The second case involves manual transfer of light loads of shafts every hour or so to the magazines at the charging end of the carburizing furnace. Here, the cost of automation between the separator at the washer and the furnace magazines cannot be justified.

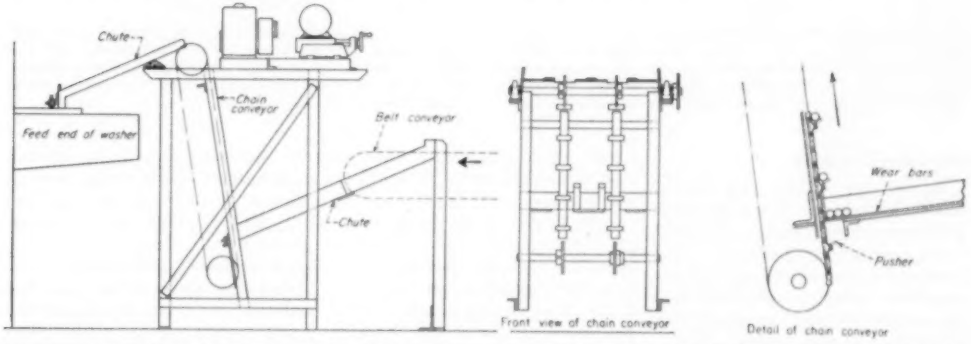
The partial layout of the rocker-shaft department identifies location of principal automation items.



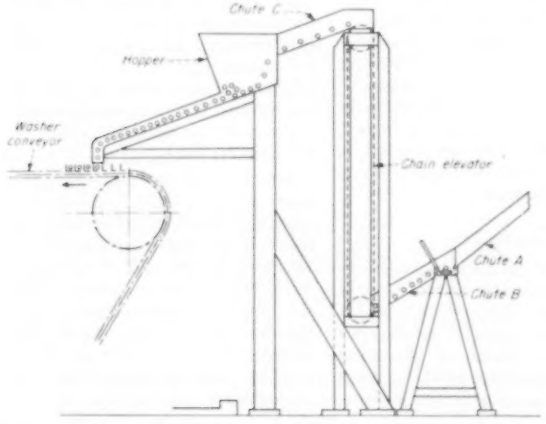
Automation Item No. 1—at Op. 20, transfer container discharges to hopper 1, which has cross-transfer chain conveyor in bottom to meter shafts to hopper 2. Chute *A* receives shafts and guides them into special hopper 2 that feeds trunnion fixture on special eight-way machine

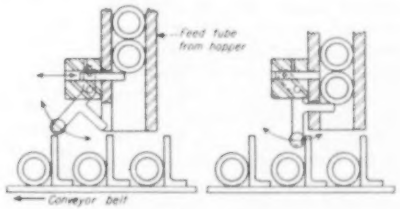


Automation Item No. 2—Rocker-arm shafts are ejected automatically from Op. 20 and are pushed along a U-shaped trough by continuously running rolls. Shafts fall into a hopper with metering device. A part that has been dropped from the hopper pushes in the plunger of a limit switch, and the metering device is caused to remain inactive until this shaft clears the limit switch. Thereupon, the limit switch arm drops, and a solenoid-operated cylinder causes the metering device to drop another shaft on the silent chain feed

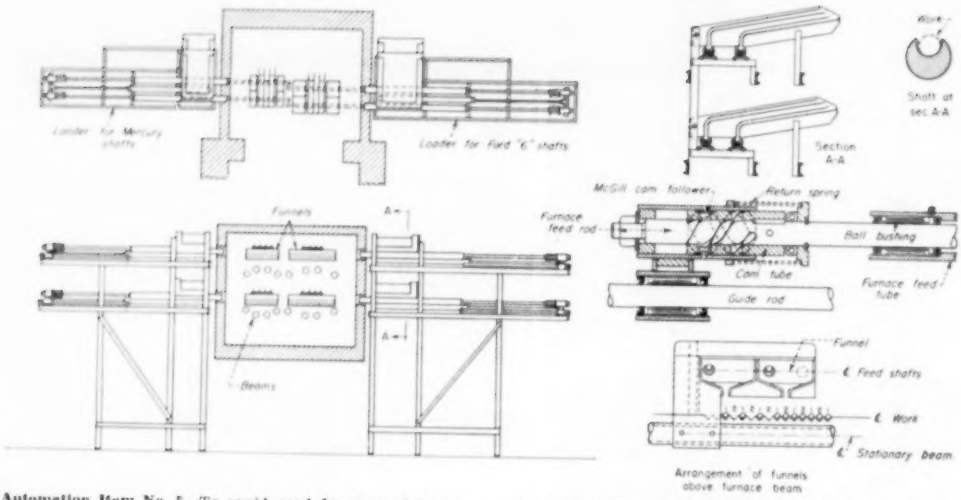


Automation Item No. 3—Centerless grinders (Op. 40) discharge shafts, indiscriminately of their length, onto a belt conveyor. Shafts are conveyed to a chute leading to a silent-chain elevator fitted with crossbars. The elevator discharges into a chute, which feeds the shafts onto the washer conveyor. In this case, the washer conveyor consists of two strands of 3-in. pitch, silent chain connected by link bars fitted with rings. The shafts lie in troughs created by the intermeshing rings and are conveyed through power sprays. At discharge end of the washer, Automation Device No. 4 (not shown) separates the shafts by length and puts them into bins. From this point, shafts are manually transferred to the carburizing furnace (next page)





Automation Item No. 12—(not shown on partial layout)—Hardened shafts are discharged onto belt conveyors by centerless grinders and taken to chutes feeding a chain elevator. Hopper discharge has a pendulum-type metering device. When pendulum is pushed left by angle spacer on wire belt of washer, a stop allows part to fall a predetermined dropping distance. Meanwhile, a latch restrains other parts. After angle passes, pendulum moves right, latch withdraws, and stop holds next piece



Automation Item No. 5—To avoid need for manual loading, shaft by shaft, the walking beam furnace is fitted with magazines holding material for 1 hr. 20 min. production. In timed relationship to stroke of the movable beam, each air-operated loader enters its magazine, scoops up a shaft in the recess of the loader plunger, pushes the shaft into a "funnel" within the furnace, rotates 180° and then returns to out position. The shaft falls into space 1 or 2 on the stationary beam, according to funnel position. Carburizing cycle requires 3 hr.

Furnace Loading

Rocker-arm shafts are light. Since automation between the washer and the carburizing furnace is not economically justified, a department attendant periodically replenishes hoppers built into the pneumatic loaders arranged on either side of the furnace at the front end.

The furnace is arranged to handle two layers wide and two layers high. Thus, at each stroke of the walking beams, eight shafts are advanced one step on the stationary beams. Mercury shafts are handled on one side, Ford six shafts on the opposite side of the furnace. Feed rods of the loaders on opposite sides of the furnace are offset to each other.

Each loader has two feed rods. In the base of the loader there is a long-stroke air cylinder. The piston rod is connected to an assembly consisting of two ball bushings that slide on guide rods, and two cam-follower housings. A barrel cam is keyed to each feed rod.

These feed rods pass through the bottoms of magazines or chutes, and they have a round-bottomed lengthwise slot into which a rocker arm shaft will drop. At the feed stroke, the rods slide through close-fitting cast-iron bushings in the furnace wall. Near the end of the stroke, a spring is compressed and the cam followers cause the cam and feed rod to rotate 180°, dumping the shaft into a funnel within the furnace. Funnels are arranged so that the first one drops shafts only into spaces marked 1 (see drawing) and the second funnel fills spaces marked 2. After the shafts have passed the second funnel, all spaces on the stationary beam are filled. Support of the shafts in the furnace is designed to minimize warpage.

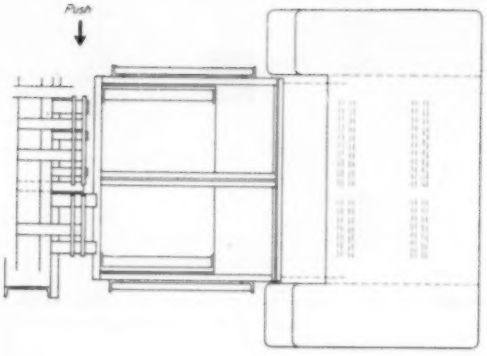
Funnels are supported from stationary beams, so that in the event of uneven expansion or lengthening of beams, funnel will still be in alignment with the notches in each beam. Funnels are wide enough to take fed shaft and re-align it in any position of notches.

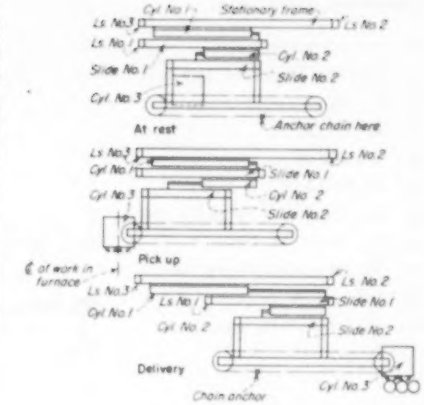
Quench Loading

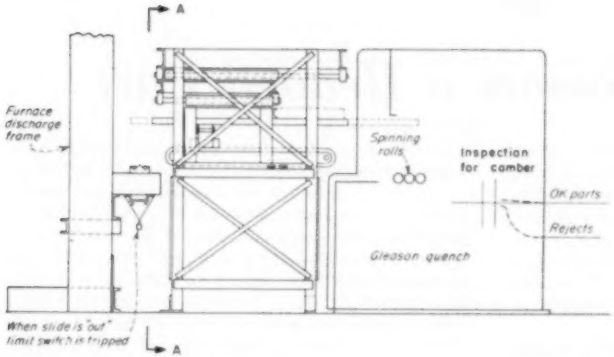
To avoid excessive straightening, and especially excessive wear of grinding wheels in the finish grinding operation, it is essential that rocker shafts do not have camber exceeding 0.005 in. This requirement cannot be met if transfer of heated work to the quench is performed slowly—as by manual means. In addition, the quenching method itself must promote straightness. Hence, Ford engineers asked for development of the spin-quench method, and the design of automation equipment for rapid transfer of the shafts from the furnace to the spin-quench rolls without being exposed to the atmosphere.

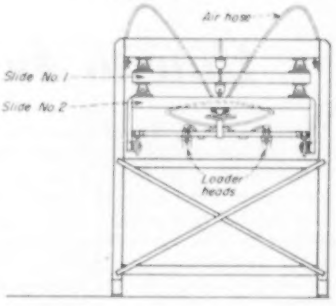
Double rams at discharge end of furnace push shafts endwise onto an elevator, four at a time. The load is lowered to a pick-off point for the quench-loader heads. When the Gleason spin quench is ready for a load, and the shafts are in position at the discharge side of the furnace, the loader operates according to the sequence listed on the opposite page.

When the shafts reach the spin-quench they are held between retractable upper rolls and spinning lower rolls. Speed of rotation is 540 rpm. At the end of the automatically timed quenching cycle, the shafts are ejected into an inspection device that checks the camber. Accepted parts go into a washer; rejected parts may be salvaged by straightening.







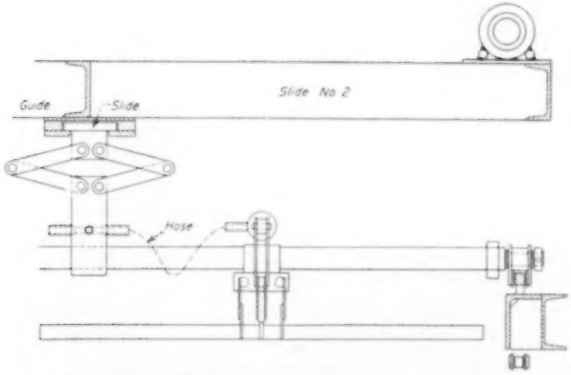


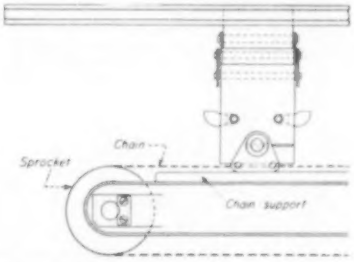
End View A - A

Automation Item No. 6—Hot, disagreeable task of transferring glowing shafts from furnace to new-type Gleason spin quench is performed in 2½ to 3 sec, far faster than by hand. In timed relationship to the furnace discharge mechanism, the loader heads are run into position to pick up 4 shafts, then run out over the spin rolls and the shafts released

OPERATION SEQUENCE OF QUENCH LOADER

1. Start signal is received from Gleason quench and limit switch on furnace.
2. Piston rod of Cyl. No. 2 moves out, carries Slide No. 2 to left, bringing loader heads over work at furnace discharge position. Limit Switch No. 1 is tripped.
3. Cyl. No. 3 moves "in," closing fingers.
4. Time delay relay times out.
5. Piston rod of Cyl. No. 2 moves in and piston rod of piston Cyl. No. 1 moves out. These combined motions traverse Slides 1 and 2 to right and bring heads over spin rolls. Limit Switch No. 2 is tripped.
6. Cyl. No. 3 moves out, opening the fingers.
7. Time delay relay times out.
8. Cyl. No. 1 moves in and trips Limit Switch No. 3, starting the quench.

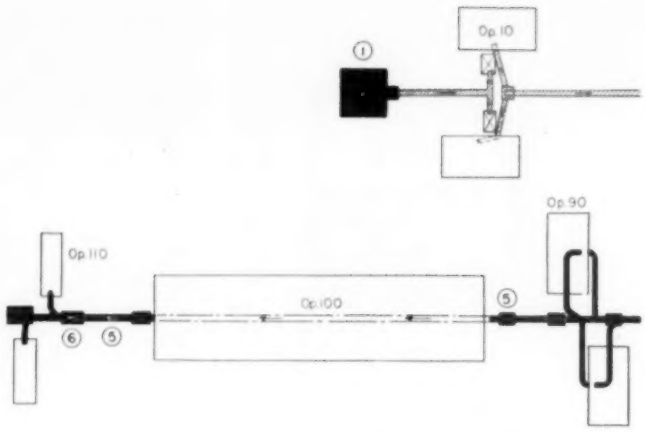




By using an anchored chain and sprocket arrangement, the stroke of the loader heads is made approximately twice that of the strokes of the two cylinders, and speedy transfer from furnace to quench is secured

Operations Performed:

Op. 10 — Centerless grind
Op. 20 — Turn neck and ball end
Op. 30 — Wash
Op. 40 — Carburize
Op. 50 — Wash
Op. 60 — Draw
Op. 70 — Semi-finish centerless grind
Op. 80 — Hone the head
Op. 90 — Final Centerless grind
Op. 100 — Wash
Op. 110 — Automatic inspection



How to Automate a Headed Part

WITH adoption of overhead-valve engines, Ford must produce a headed-type valve tappet, instead of the barrel type required for L-head engines. Government restrictions on machine-tool installations for the new engines forced use of a lower production plan for tappets. Hence, chain conveyors are used for about three-quarters of the production processes, but they function as automation devices.

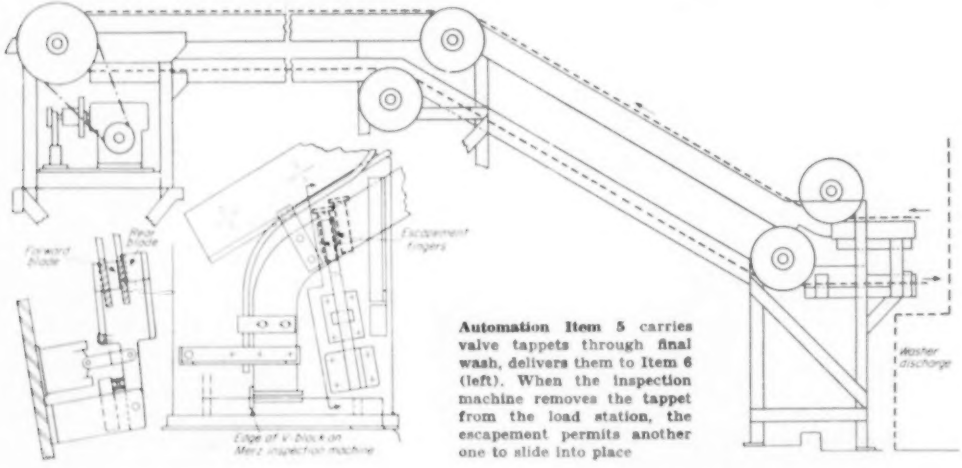
As a matter of fact, automation built around chain conveyors is likely to have advantages for many types of machined parts. The chain conveyor, with suitable attachments to carry workpieces, can be made to elevate or lower the load to suit the unloading and loading heights of various kinds of machines—machine tools, furnaces, washers, etc.

Unlike some highly mechanized lines, chain-conveyor automation requires no one to take off pieces or replace them. A hopper can meter single workpieces to chain stations. Guides or wires will sweep parts from the chain and put them one at a time into an indexing wheel. The wheel in turn can load another chain. Thus, there is no problem to loading and unloading a chain by simple mechanical means.

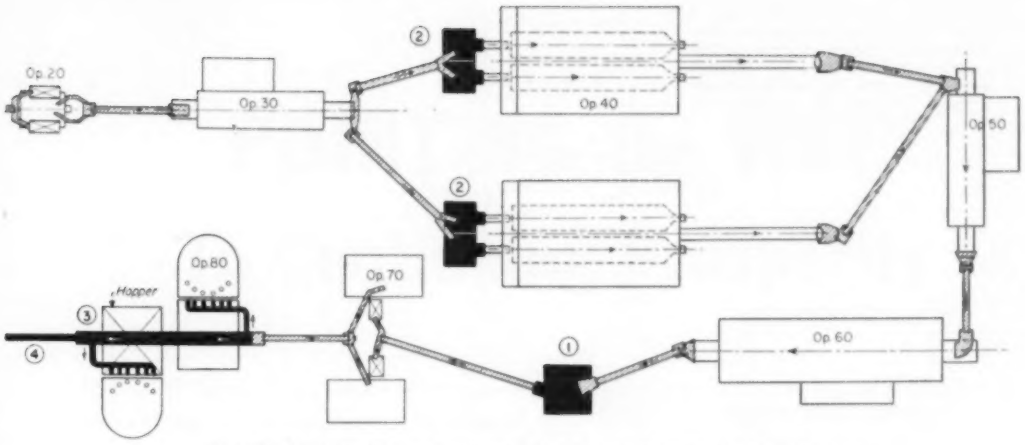
In choosing automation equipment for the valve-tappet line, several considerations had to be kept in mind:

1. Storage capacity is required ahead of furnaces, so that there will always be enough parts for 24 hr operation. Machining operations are performed for only 16 hr daily.

2. Finish-ground parts must be handled indi-



Automation Item 5 carries valve tappets through final wash, delivers them to Item 6 (left). When the inspection machine removes the tappet from the load station, the escapement permits another one to slide into place



Special automation devices are shown in black; chain conveyors by cross-hatching.

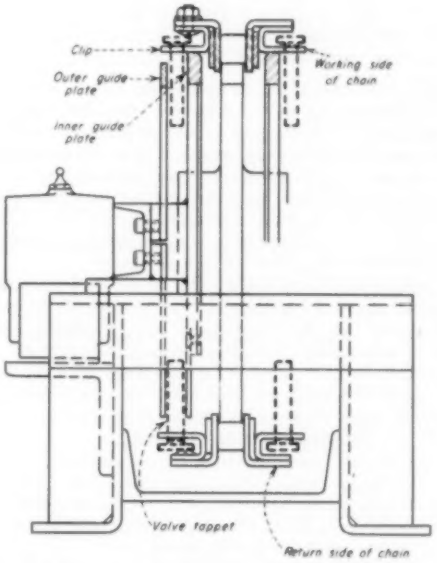
vidually to prevent marring and scratching, as in bulk handling.

The means for automating the valve tappet through the various operations are:

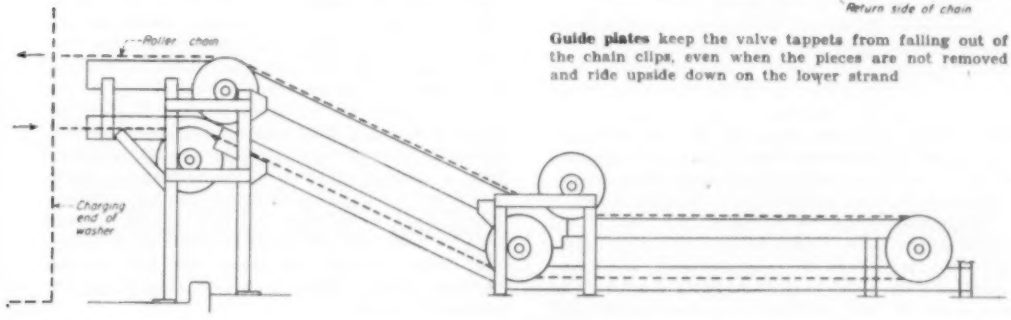
Automation Item No. 1—Rough grind on Cincinnati centerless grinding machines (Oper. 10). Automation equipment (turn page) consists of a storage hopper with capacity for 68,000 valve tappets, or two days' supply. Hopper is filled by dumping boxes lifted by high-low truck. Feed rate onto cleated flight conveyor is controlled by adjustable gate in hopper bottom and vibration frequency of Syntron feeder. Flight conveyor takes parts 6 ft above floor. Vertical plate approximately divides tappets to hoppers feeding the grinders.

Rough-ground parts are ejected from the grinders and slide down chutes to a cleated flight conveyor and are elevated to hoppers at the two spindles of a special Motch & Merryweather turning machine. At the top of the conveyor there is a two-way chute with adjustable deflector to keep the hoppers filled in approximate balance.

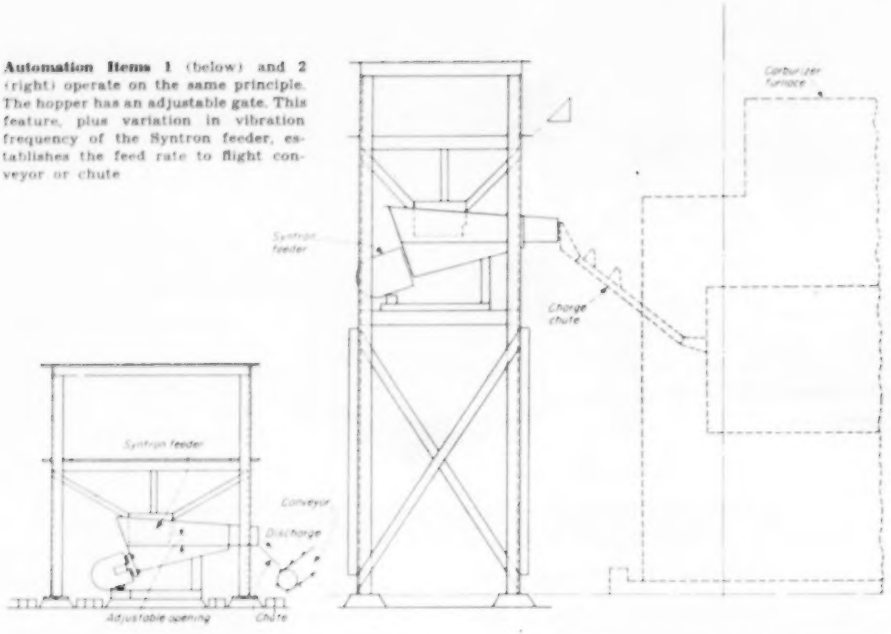
Chain conveyor is generally used throughout the valve-tappet line, except at Oper. 80, because



Guide plates keep the valve tappets from falling out of the chain clips, even when the pieces are not removed and ride upside down on the lower strand



Automation Items 1 (below) and **2** (right) operate on the same principle. The hopper has an adjustable gate. This feature, plus variation in vibration frequency of the Syntron feeder, establishes the feed rate to flight conveyor or chute



parts are hopper fed to machines, no set position is required and the part as yet does not have a high finish. Chain is used in pitches down to 1½ in., making it possible to get within 6 in. of the floor and to employ small sprockets. Cross bars to push the workpieces can be securely welded to chain and will carry loads, even if conveyor flights are nearly vertical. Such construction is deemed more durable than belts with cleats riveted in place.

Automation Item No. 2—The carburizing furnace, washer and draw furnace operate 24 hr daily. Therefore, the two storage hoppers at carburizers take in 3 parts from preceding operations and feed 2 parts to furnace retorts. Hoppers have capacity for 8 hr. Flight conveyor from Op. 30 approximately divides parts between the two hoppers. Each hopper has two Syntron vibratory feeders.

At the discharge end of the draw furnace, there is a hopper duplicating Automation Item No. 1. Each time the furnace puts in 2 pieces, the grinders remove 3 parts. Thus, 3rd-shift delivery compensates for faster usage in the daytime.

Automation Item No. 3—The flight conveyor from the centerless grinders, Op. 70, discharge onto a belt conveyor about 7½ ft above the floor. Air-operated diversion bars above the conveyor sweep parts into chutes leading to the 6-compartment feed hoppers at each Hoern & Dilts honing machine. Each hopper compartment has a pick-up blade of the centerboard type for loading machine fixture. Diversion bars are operated by a sequence timer.

Automation Item No. 4—Since the head of the valve tappet is now honed to a 4 micro-inch finish, the part must now be conveyed and loaded individually to avoid scratches. Parts ejected from the Hoern & Dilts machine slide down chutes and are loaded onto a 1¼-in. pitch chain with 11/16-in. clips fastened on both sides of each link. The 9/16-in. space between clips is just sufficient to enter the valve-tappet stem. The chain rises to a suitable height so that parts can be unloaded automatically into slide rails serving the last centerless grinding operation, Op. 90.

Automation Item No. 5—Centerless ground parts are loaded onto a chain with clips, to enter the washing machine. Upon emerging from the washer, the chain rises to about 6 ft at the transfer point to the next piece of automation equipment.

Automation Item No. 6—This device consists of guide rails equipped with an escapement mechanism. The inspection machine, Op. 110, consists of series of V-blocks with a walking beam that transfers valve tappets one at a time. Tappets are fed onto the inspection machine by means of a solenoid-actuated escapement. The solenoid is energized by the operation of a drum-type limit switch which is mechanically timed with the machine cycle. The escapement consists of two blades. While the forward blade is receding to release one tappet, the rear blade enters to restrain the following tappet. The released tappet slides down wires, and comes to rest on the V-block.

Some means are required to load Automation Items 4, 5 and 6. This will be done by a notched wheel. Synchronization is obtained by taking power from a take-off sprocket on the automation chain. The wheel would be loaded by gravity, and a spring-loaded finger would apply a small amount of pressure to push the part into an open chain space. This finger retracts and leaves the part on the notched wheel if there is a part already on the automation chain.

POINTING the WAY
To Continuing Prosperity

The set of figures in the middle of this page is news of high importance to every American.

In effect, it says that there is no basis in fact for all this talk about a collapse of capital expenditures plunging us into a depression following the industrial build-up for defense.

Such talk assumes that without defense orders business would spend relatively little for new industrial plant and equipment. The figures below show that that assumption is not justified.

penditures in 1953, 1954 and 1955, provided the money to carry them out can be obtained.

A Record in '52

As was expected, their plans call for another record-breaking volume of capital expenditures by business in 1952. But, as many did not expect, the McGraw-Hill survey also discloses plans for very heavy capital expenditures in each of the three years following. Expenditures now planned for those years are, to be sure, lower than those planned for 1952. But the significant fact is not that

BUSINESS PLANS FOR NEW PLANTS AND EQUIPMENT (Millions of Dollars)

	Actual Spending 1950*	Actual Spending 1951*	McGraw-Hill Survey			
			Planned	— Preliminary Plans —		
			1952	1953	1954	1955
Manufacturing	7,491	11,141	12,921	10,028	8,525	8,194
Mining	684	806	943	415	321	358
Railroads	1,136	1,564	1,642	1,248	1,117	1,002
Electric & Gas Utilities**	3,298	3,676	3,948	3,360	3,204	2,748
Other Transportation & Communications	1,392	1,592	1,721	1,671	1,943	1,839
ALL INDUSTRY	14,001	18,779	21,175	16,722	15,110	14,141

*U. S. Department of Commerce
**Electrical World (A McGraw-Hill publication) and American Gas Association.

The figures come from the fifth annual McGraw-Hill survey of business plans for new plant and equipment. Companies were asked to report through that survey not only their plans for 1952, but plans they now have in hand for capital ex-

they are lower. Experience shows that plans made several years ahead always overlook many expenditures that are needed later.

The significant fact is that the expenditures already planned for 1953-55 are so high. For example,

those now planned for 1955 would be higher than those of 1950, which, at that time, were second highest in our history.

If these plans are carried out we shall have an essential element of continuing prosperity. Sustained expenditures for capital expansion and betterment account directly for a large share of our employment and consumer income. Moreover, consistent modernization of industrial plant raises production efficiency and brings more and better goods and services within reach of more consumers.

It is not to be expected, of course, that we can come down from the peak of the defense boom without readjustments in some sectors of business. But if capital expenditures by business are carried out on the scale now planned, we shall be able to take any necessary readjustments in our stride, and continue to increase our industrial strength.

From V-J Day to the end of this year, manufacturing industries will have spent over $60 billion for new industrial plant and equipment. This is more than the value of all the plant and equipment these industries had on their books at the end of World War II. It is this heavy outlay that causes some, assuming most postwar plans for industrial expansion and modernization will be completed, to fear a collapse of capital expenditure.

Plans to Go Ahead

But American industry still has plans to go right ahead expanding and improving its facilities. This was the most striking single finding of this year's survey.* It disclosed also that after 1952:

– 83 per cent of the companies answering the survey are planning substantial further modernization.

– 48 per cent will need more capacity to make their present products.

– 33 per cent plan additional capacity to make new products.

It cannot be too strongly emphasized, however, that these plans represent what American industry *wants* to do. They are a concrete expression of hope and aspiration. As such they are extremely important, for they dispose of the idea that business considers the job of expanding and improving its facilities as finished, or anywhere near finished.

But the plans carry no guarantee of accomplishment. If they are to be realized, business must have the funds to carry them out. There is no assurance that the money will be available if the present level of corporation taxes is continued. Eight out of ten companies, according to the McGraw-Hill survey, will rely entirely on profits and reserves to finance their 1953-55 programs. So, in calculating their programs for these years, the companies were asked to assume relief from "excess profits" taxation.

Federal taxes now take at least 52 per cent of a corporation's profits, and 82 per cent of any profits in the so-called "excess profits" bracket. Despite this drain on their funds, companies are able to finance their 1952 programs because (1) they are borrowing heavily, and (2) many of them are getting government loans or special tax concessions on new facilities installed for defense purposes. But these are emergency aids.

Only Two Ways

When the present defense program tapers off, there will be only two ways by which business can possibly increase its principal source of funds for new plant and equipment. One way is to make more profits before the tax collector takes his cut. And the only way many companies, already operating at capacity and high efficiency, can do that quickly is by raising their prices. That is an unpopular method. Also, with the return to more competitive markets, it might be self-defeating.

The other way is for the federal government to release its strangle hold on business profits. The so-called "excess profits" tax – the 82 per cent tax which is really a tax on business growth – should be repealed, effective January 1, 1953. And a cut in the basic tax of 52 per cent on all corporate profits should come not much later. That is by all odds the most important single step toward assuring that business plans already made for capital investment in 1953, 1954 and 1955 are carried out. It is the most important single step toward sustaining our present prosperity.

Through its plans for continued expansion and improvement of its facilities, American business clearly points the way to avoid the depression that so many have feared – and the Communists have so ardently hoped – would follow the peak of defense mobilization. It will be a tragedy for our country and for Americans in every walk of life if we do not insist that business get the chance to follow this wise and constructive course.

McGraw-Hill Publishing Company, Inc.

*Note – A copy of the full report of this survey can be obtained by addressing: Department of Economics, McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York 36, N. Y.

ROUND TABLE

Last of the Mechanics

"What is this, Ed, a machine shop—or a style show? Take a gander down the line at Mullins. Who's he trying to impress? He's even wearing fawn-colored spats!"

"It's a cold day, Al, and spats would make my feet warmer—I don't blame Mullins. Besides, I don't recall any manifesto from management to the effect that a certain uniform is required."

"But he's dressed for church, practically! And that dinky little white apron—boy, I'd sure hate to pay his cleaning bills! The other boys are in old clothes and overalls. They have some protection against the grease and dirt; he doesn't have any. He's even wearing a white shirt!"

"Al, you don't have to pay his cleaning bills; he does. And if you'll look close, you'll see that he isn't dirty, nor is his bench. He works clean—and stays clean."

"I still don't see any reason for the style show—I'd think the other boys would ride him."

"They don't dare. He's the best toolmaker I've got, and everybody knows it. He can wear a bathing suit if he wants to, as far as I'm concerned."

"What's his ability got to do with his clothes? He ought to set a sensible example for the rest."

"Al, you're 'way too young to remember, but, 75 or 100 years ago, the toolmakers were the kings of the shop—and they showed it. They wore top hats and frock coats to work, carried gloves and walking sticks. They didn't wear those while they worked—but they wore 'em on the street to show they were proud of their profession. Now everybody is ashamed of it—they all hide behind overalls and a union button, except Mullins. He's still proud of himself and his job."

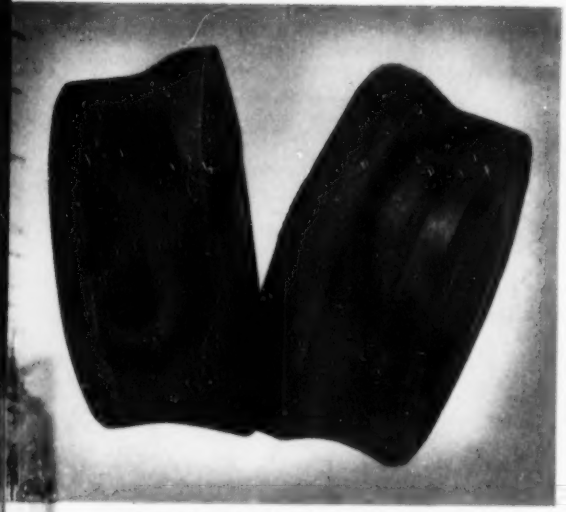
"No, Ed, I hadn't heard that about the top hats, but I still think that time is gone. Look at all the lodge regalia and everything people used to wear. They don't any more. We've quieted down."

"Quieted down, nothing! We've gotten scared out of it! In the old shops, the row of pictures of men in top hats in the front hall wasn't of the board of directors—it was of the toolmakers, and was a guarantee of ability. Now they have a lobby with a receptionist that's dumb but beautiful, a couple of membership certificates, and some glamor pictures of shop operations, featuring the sloppiest guys in the plant because they're 'typical workmen'—or union stewards."

"Ed, you're exaggerating, as usual. I can see sense in a draftsman or front-office man staying dressed up, but not a guy out here. It's too dirty."

"Look at Mullins—it's not too dirty for him! Remember, Al, that a good man doesn't have to get himself all dirtied up to prove he's working. Nope, let Mullins stay dressed up; I use him for an example to the apprentices."

***Is Mullins** a last survivor of the days when toolmakers were honored men? Is he right, or wrong, in his dress? Do clean clothes and shops aid morale? Your ideas and opininons on this subject will interest others. Discussions of earlier topics appear on later pages.*



Laminated hardwood rolls were the first attempt at low-cost tooling. This set failed by chipping along the grain within 25,000 ft of rolling aluminum strip

Springback pass for small hat section uses steel shims in the split male roll to accommodate various gages

U-section, 1¼ in. deep was formed to 90° angle in existing 5-pass steel rolls, then crowded into U-section in these rolls in one pass. Material was precut strip, so female roll received abnormal punishment. Steel collars on roll augment side pressure. Note condition of rolls after 60,000 ft of section

HOW TO ROLL BACK FORMING COSTS

If you want to roll-form aluminum but production does not justify making hardened rolls, here's a trick that's a real money saver

By A. F. SCHUB, Douglas Aircraft Co., Santa Monica

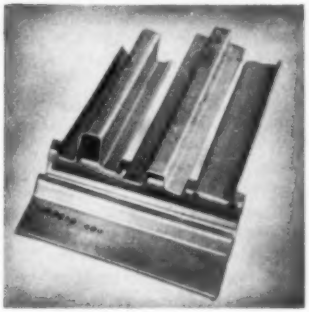
Employment of impregnated-wood rolls started in the Douglas plant because of an investigation into the possibilities of a less expensive method of rolling sections. We needed this to enable us to operate our Yoder rolls for short-run parts formerly produced on power brakes. Such parts could not be produced accurately enough to coordinate with subsequent tooling used for contouring, joggling, and assembling.

Various types of material were tried; some helped but were not the real answer to our problem. On limited runs, the stock is sheared from sheet, instead of being furnished in coils. This causes the rolls to take severe punishment from the edge of the strip as it is fed into each pass. For this reason, our trials with laminated hardwoods (maple and birch) and forged aluminum showed them to have extremely short life. The wooden rolls, in particular, chipped along the grain and proved worthless after a very short run.

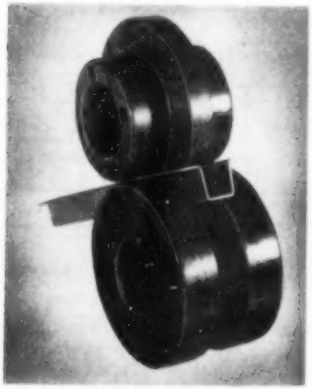
Rolls made of SAE 1020 and SAE 4140, heat-treated to R. 38-40, were almost as susceptible to nicking from the strip as were the wood and aluminum rolls. Moreover, the steel rolls were not so satisfactory as wood or aluminum because of the additional weight. In addition, experience has demonstrated that steel rolls are much more prone to be damaged during handling between setup and storage than are the wood or aluminum rolls.

We had been using Hi-Den 112 impregnated wood, made by Parkwood Corp., for stretch-wrapping dies, and for wear plates on the Yoder machines, and decided to try this as roll material. The first job was on an order for 20,000 ft of formed strip, with no future reorders contemplated. This would normally classify the job as a power-brake section, but because of the demand for development of in-

Section formed on Hi-Den rolls, with last pass on hardend graphitic steel, is stretch-wrapped to contour after forming. Coordination problems between manufacturing the section and fitting consistently to the stretch dies have been eliminated



All these sections were produced with new-style rolls and a sizing pass in hardened and ground steel. Flat section (right) was made in three different widths of 24S and 61S aluminum, but all were made in the same rolls



Square hat section had to be constant to permit stretch wrapping; but production requirement was low. Section was formed in a 4-pass set of impregnated wood rolls, and was better than when made in a press brake

expensive rolls, we decided to try laminated hardwood. These broke down, as shown in an accompanying illustration, after 25,000 ft. A reorder was then placed for an additional 25,000 ft, and we decided to replace the rolls with Hi-Den. After 30,000 ft with this material, the rolls were unblemished and in excellent condition. There was no pickup or galling, as with aluminum and steel rolls, and no chipping, as with wooden rolls. We attribute this to the resiliency of the plastic bond and to the cross-ply construction of the material. No additional orders have been released for this particular section, so a complete test has not been possible.

The results of this test were so encouraging that we applied the material to other roll-forming operations with remarkable success. One trouble with press-brake forming was that of keeping parts straight during heat treatment. This no longer exists, because we can now roll in the as-quenched condition.

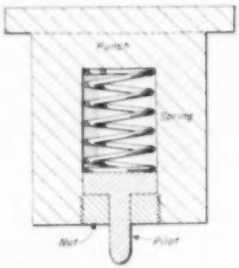
Our present practice is to use the impregnated wood on all preliminary stages of forming, and to revert to steel for the final passes only. The only restriction on the use of the material is where severe forms and thin sections occur. Usually these are not encountered until the final pass, so no problems are apparent. Dimensions can be held by turning, but any slight discrepancy between male and female rolls does not create so much trouble as a set of mismatched steel rolls, because the phenolic has enough yield to insure satisfactory mating.

Because of this, and because the material machines easily, our fabrication time has been reduced 50%. The maximum thickness of the material is 2 in., so wide rolls are formed by bolting pieces together. We consider this preferable to bonding, because of the high side pressures involved.

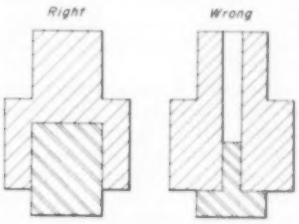
During the past six months, we have made upwards of 100 sets of rolls, and in every case they have proved an excellent solution to the problem of inexpensive tooling. Thus far, we have never run one of these rolls to destruction.

DIEMAKERS KINKS

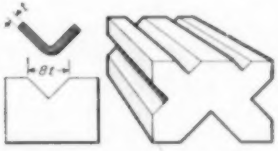
BY FEDERICO STRASSER



PILOTS for blanking punches in progressive dies are useful in securing greater accuracy. Solid pilots may break in case of miscuts, where the pilots do not enter the previously pierced holes. To avoid this danger, especially when pilots are small, use the disappearing type.

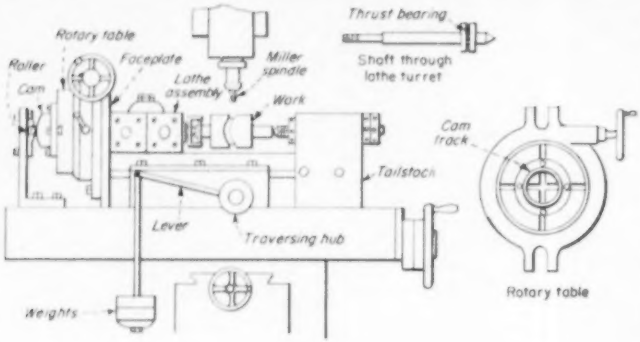


FORMING PUNCHES held in punch holders are best if made the same diameter as the punch-holder shank. Then, if there is any variation in free height, the assembly can be shimmed more effectively. In case of the two-diameter design, such correction is troublesome.



TO MAKE a "universal" V-bending die, machine V-shaped channels in the female die part. Make each die opening width equal to eight times the stock thickness contemplated. There is no such thing as a "universal" bending die, but the tool shown will accommodate several stock thicknesses.

Practical Ideas



Turret Slide and Miller Cut Cams

THERE ARE ALWAYS a number of ways to do odd jobs; some easy, some not so easy. Here is a method we developed for making barrel cams from a round master cam track that works rapidly and efficiently.

The machine was a vertical miller with a large table. On the table we mounted a lathe turret, including the whole slide, the base casting, and the traversing mechanism. Thus, we had a turret that could be traversed across the table.

Next, we removed the operating wheel that traversed the turret slide, and replaced it with a drum, spoke, and weight hanging on a rod. This was to load the slide so it would press to the left all the time.

A heavy faceplate was mounted against the left-hand face of the turret by means of four bolts countersunk into the faceplate. This supported a rotary milling table with its vertical axis horizontal. The table was held in place by a center spindle equipped with a thrust bearing. The bearing was at the opposite side of the turret, and that end of the spindle was ground to act as a center for the work mandrel.

Barrel-cam blanks, after being turned, were mounted firmly on the mandrel, which was held between centers. The tailstock center was a special one attached to the turret slide so it would move with the turret head.

At the headstock end of the mechanism, an angle plate was fixed to the milling-machine table to support a roller. This was off the center of the rotary table and work mandrel so the master cam track would ride against it. The cam track was machined on a solid piece of steel, and bolted against the rotary table on center.

Thus, only the base of the turret slide and the angle plate were actually fixed to the miller table. A cutter of suitable diameter was held in the miller spindle, and adjustments of the miller table positioned the work under it in correct relationship. With the cutter rotating, the rotary table was revolved by hand. Pressure of the weights forced the slide to make the cam track work against the roller, traversing the whole turret slide, and making the cutter form the curved track in the barrel cam. *Allan Clarke, Rochdale, England.*

Screw-Clamped Fixture Has Fast Action

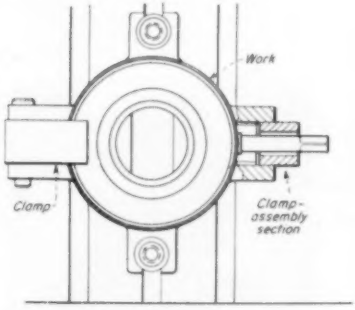
THIS FIXTURE clamps a flanged part so we can take a slotting cut across the crown of the workpiece. For this job we wanted fast action, but also positive location. Therefore, we built the fixture around a split screw, with one end threaded right-hand, and the other left-hand.

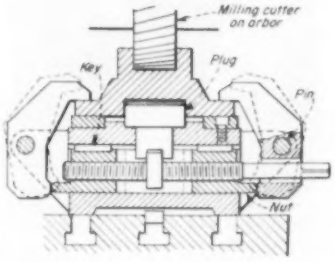
The threads do not meet in the center of the screw because a shoulder is left to work in a slot in the bottom part of the locating plug—to prevent endwise motion of the screw as it rotates. The plug is made to locate the part exactly, and sits partly above the surface of the fixture.

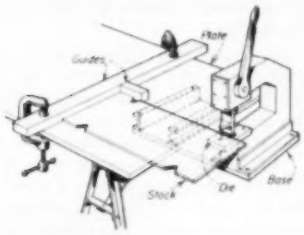
A locating ring is screwed into the surface of the fixture to level the work. Both this and the plug may be changed for other workpieces of similar nature.

The clamps, pivoted on pins through extended brackets to the right and left of the fixture, are driven by round nuts. These have been cut to leave rounded ears that actually push the clamp arms. Both the nuts are keyed into slots in their clearance holes in the fixture to prevent their rotation.

In case it is necessary, different clamp arms can be substituted for the ones in place. *Tom Brown, Perivale, England.*





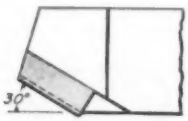


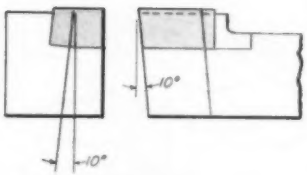
Punch Table Simplifies Notching

TO ELIMINATE side shelves and adjustable supports, we added a side table to a bench lever-action punch. It increases accuracy, and makes the work much easier on the operator.

The punch is bolted to a baseplate, which is also equipped with angle-iron and channel supports. These support a flat steel plate just next to the punch and on a level with the die. The whole assembly is bolted together to make a unit.

Various gages and guides can be clamped to the plate to guide the work into the press. *Pablo Redl, Buenos Aires, Argentina.*





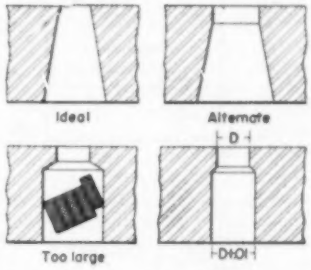
Carbide Toolbit Reground Only on Top

THIS DESIGN for a brazed-on carbide toolbit, attached to a steel shank, allows almost all resharpening to be done by taking material off the top of the bit. The idea increases the life of the tool greatly; partly because the carbide can be ground quite thin before it breaks, and partly because the brazed joint is not heated by grinding, and therefore has less tendency to break up. *J. M. Askin, Lufkin, Texas.*

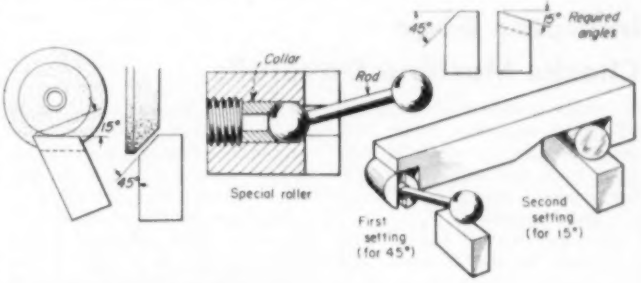
Minimum Slug Clearance Prevents Jams

TAPERED SECTIONS for piercing dies are best, of course, but they are sometimes difficult or inconvenient to produce. Cutting the punch-clearance and slug hole in a die is often done with an oversize drill, and here is where you often hit trouble.

It might appear to be sensible to make this hole a great deal oversize to clear the slugs; but the slugs often bunch up and clog the die anyhow. A better way is to drill the hole only about 0.01 in. over the size of the punch.



Allowing little, but adequate, clearance for slugs, the hole will not allow them to rotate as they drop through, and will prevent them from bunching. *Federico Strasser, Santiago de Chile.*



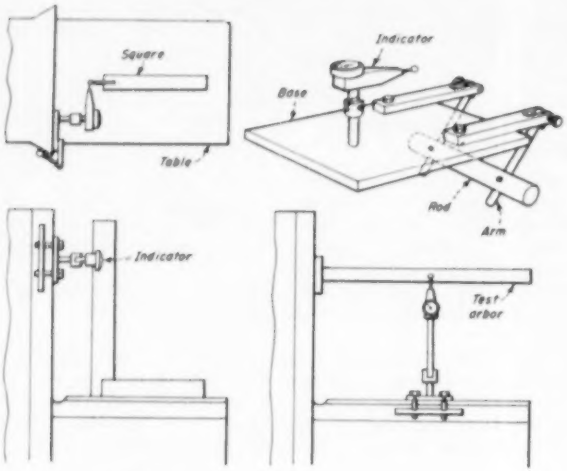
Sine Bar with Lever Corrects Compound Angles

WHEN COMPOUND ANGLES are ground on cutting tools, an ordinary sine bar will not correct one angle in relation to another, but a sine bar with a ball-lever attachment will.

The attachment is a rod with a ball at each end, and with the distance between ball centers some convenient dimension. One ball end is gripped inside a special sine-bar roller, which has a confining shoulder and a locking screw and collar that will clamp the lever in position. A slot at the end of the roller allows vertical movement of the lever.

The main angle required (for example, a side cutting-edge angle) is set on the lever. Taking into account the difference in radii between the roller and the ball, gage blocks are set under the ball to jack up the lever to this angle. Now the lever is locked, the gage blocks removed, and the second angle (front clearance) is set on the sine bar, using the rollers. The altered roller that holds the ball lever is the same size as the original one, so sine-bar setup is normal, with gage blocks being set under the rear roller.

Setting this angle alters the height of the extended ball, so the height of this ball is measured and the dimension converted into a corrected angle. This is the angle to which the machine or fixture is set to produce the required angle on the work. *R. G. Vare, Christchurch, England.*

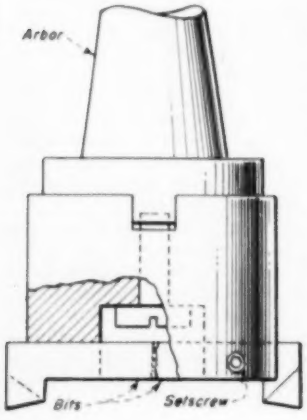


Indicator Gage Checks Machine Dovetails

WE ALIGN MACHINES precisely and efficiently with this layout tool, which is made up of a dial indicator, base, and adjustable dovetail gripper. The gage is simple and quite adaptable.

Actually, the tool will not grip a dovetail, but the adjustable arm with the rod will ride up and down on the edge of a slide way, holding the dial indicator at the same distance from the edge of the way all the time. Therefore, by holding the tool against a dovetail edge, we can take readings from the indicator against a square or any other reference edge or surface.

The base can also be fitted with T-slots or plain bolts and a long T-bar to slide in a table T-slot, which allows checking alignment of arbors, machine overarms, and the like. *Fred H. Lingenfelder, Milwaukee, Wis.*



Welded Lathe Tools Make Flycutters

Because of the high cost of carbides here, we decided to make do with two lathe tools instead of special bits for a flycutter we were making.

The toolbits were of the angle type, and were placed in the slots of the flycutter head, which was to attach to a milling arbor. The bits were butted together and welded to form a single cutting unit. Setscrews held the cutter in place. The holder was keyed to the end of a miling arbor that was mounted in the lathe headstock. *Allan Clarke, Rochdale, England.*

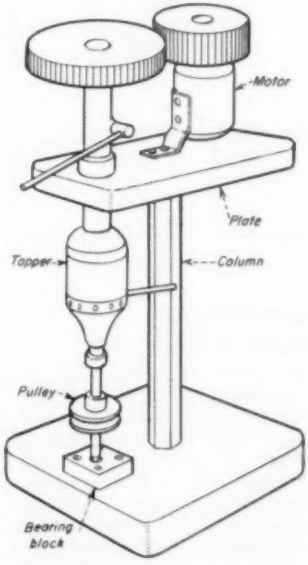
Attachment Feeds Grinder On Lathe

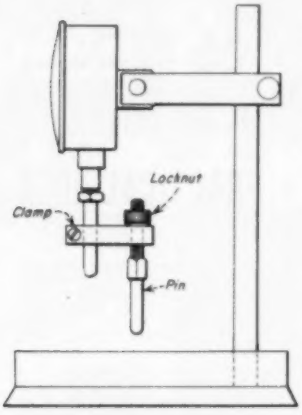
FOR THOSE FEW LATHES without leadscrews, this attachment provides accurate, constant-speed traversing for a grinding attachment mounted on the lathe slide.

An aluminum base supports a hex column which carries a plate. On the plate are mounted a fractional-horsepower motor that rotates a standard spur gear through a fiber gear with a face 50% wider than the steel gear (to allow for some vertical motion).

The fiber gear operates a tapping attachment. Chucked in this is a shaft that carries a V-belt pulley, and which is nested in a 60°-center bearing block on the base. In place of the traversing wheel on the carriage, a similar V-belt pulley is mounted.

Connected by a belt, the attachment will power the carriage easily to the right or left, controlled by the lever on the tapping-attachment shaft. The attachment can be mounted on the carriage; or, if the amount of traversing is slight, can even be on the floor under the edge of the carriage. Pulley ratios determine the speed of travel. *Frederick C. Lurz, W. Hempstead, N. Y.*





Indicator Attachment Checks Extra Dimension

ADDED to an ordinary dial indicator, where it clamps on the regular spindle, this secondary spindle will give readings on a second thickness of a workpiece.

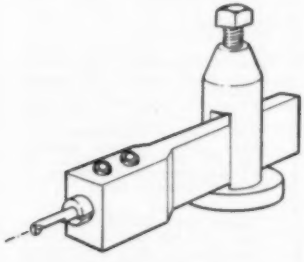
The bracket clamps on the spindle, and is held by a screw. The vertical pin is hardened after threading, and is positioned, then locked with the knurled jam nut.

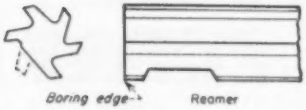
Assume you are checking two dimensions on a shouldered workpiece. The larger one is inspected by using the main indicator spindle, after the indicator is adjusted to the correct height. The second dimension is inspected by adjusting the attachment pin to the required dimension when the main spindle is located at the first dimension. Thus, both spindles will indicate their respective dimensions when the dial reads zero.

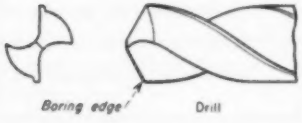
Some adjustment of the indicator bezel may be necessary to compensate for the extra weight of the attachment. *R. H. Fry, Croydon, England.*

Boring Tools Made From Old Drills, Reamers

FOR SMALL WORK around the shop, this sort of boring tool can be quite handy and efficient. The holder is a block with a rectangular shank that is cut to fit a toolpost. Being made for a given lathe only, the rocker base can be left off, providing clearance for a thicker, stronger shank.







For tools, we often utilize old, broken drills and reamers. Some of each edge is ground away back from the tip to give the cutting lip shape. If necessary, one or two adjacent flutes can be ground away for clearance. An old reamer has an especially long life, because a second or third flute can be ground to shape for later use as cutting edges. *George J. Van Hecke, Detroit, Mich.*

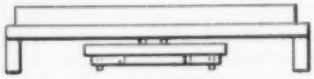
Six-Station Table Is Easily Built →

EVEN FOR SHORT RUNS, this table can be economically built to handle six (or eight) positions.

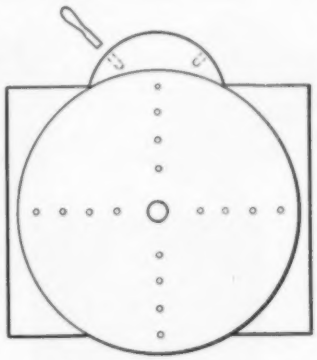
The principle of operation is based on two disks, which work together under the bridged baseplate of the fixture. One is an indexing disk, keyed to the table on top of the fixture, and with edges cut concave so six equally spaced sectors are produced. The locking disk is round, to the same radius as the concave sectors on the other disk, but also has an extra flange on which two pins are mounted.

As the locking disk is rotated by its removable handle, a pin engages one of the edge slots in the indexing disk, which makes that disk turn. When the indexing disk has rotated 60°, the pin will have come out of the slot, and the locking disk can be either rotated some more, or backed up to engage its OD against the concave sector of the indexing disk. Depending on fits and tolerances, this will accurately lock the table in position.

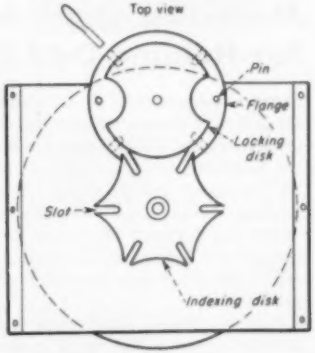
If the mechanism is built to about the proportions illustrated, the pins in the flange of the locking disk will easily slip into the slots of the indexing disk. *J. C. Salinas, Corpus Christi, Texas.*



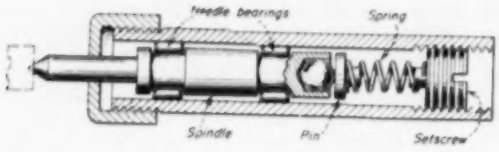
Side view



Top view



Bottom view

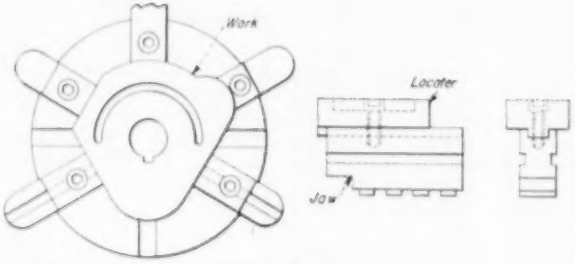


Tailstock Center for Old Lathe Is Spring-Loaded

As a replacement for the conventional tailstock center, or as an addition to a small lathe that has no tailstock center, this mechanism speeds repetitive work when simple turning is to be done. It can be mounted in a steadyrest.

The hardened center spindle is fitted with two needle bearings for concentricity. A ball nests in a drilled hole in the rear of the spindle, and this is held in place by a shouldered pin and spring. Pressure of this assembly against the tailstock spindle is adjusted by means of a setscrew threaded into the rear of the housing. A cap over the front end confines the spindle.

Once the setscrew is set for correct pressure against a given piece of work, loading is done by pressing the centerdrilled hole in the work against the spindle, forcing the spindle back, and then slipping the front end of the work onto a center or into a chuck. *Pierre Wilmus, La Hulpe, Belgium.*



Multi-Jaw Chuck Adapted For Holding Odd Shapes

Several components of irregular shape required semi-circular ridges or cam tracks. These were cast on the faces of the parts, and had to be machined for accuracy. For holding the parts so these tracks would be centered correctly, we devised jaw extensions for a standard 3-jaw chuck that was adapted for the job.

Five additional slots were cut across the face of the chuck to expose the scroll. Into these, additional jaws were mounted, and adjustable locator clamps were mounted on top of the clamp jaws. It was not necessary to use all of the possible jaws on this part, but the chuck is now equipped for almost any odd shape of workpiece.

After the locator blocks were adjusted to grip the work on center, all that was necessary to grip a new part was to operate the chuck as we usually do. *R. G. Vare, Christchurch, England.*

$25 *In addition to regular payment*

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

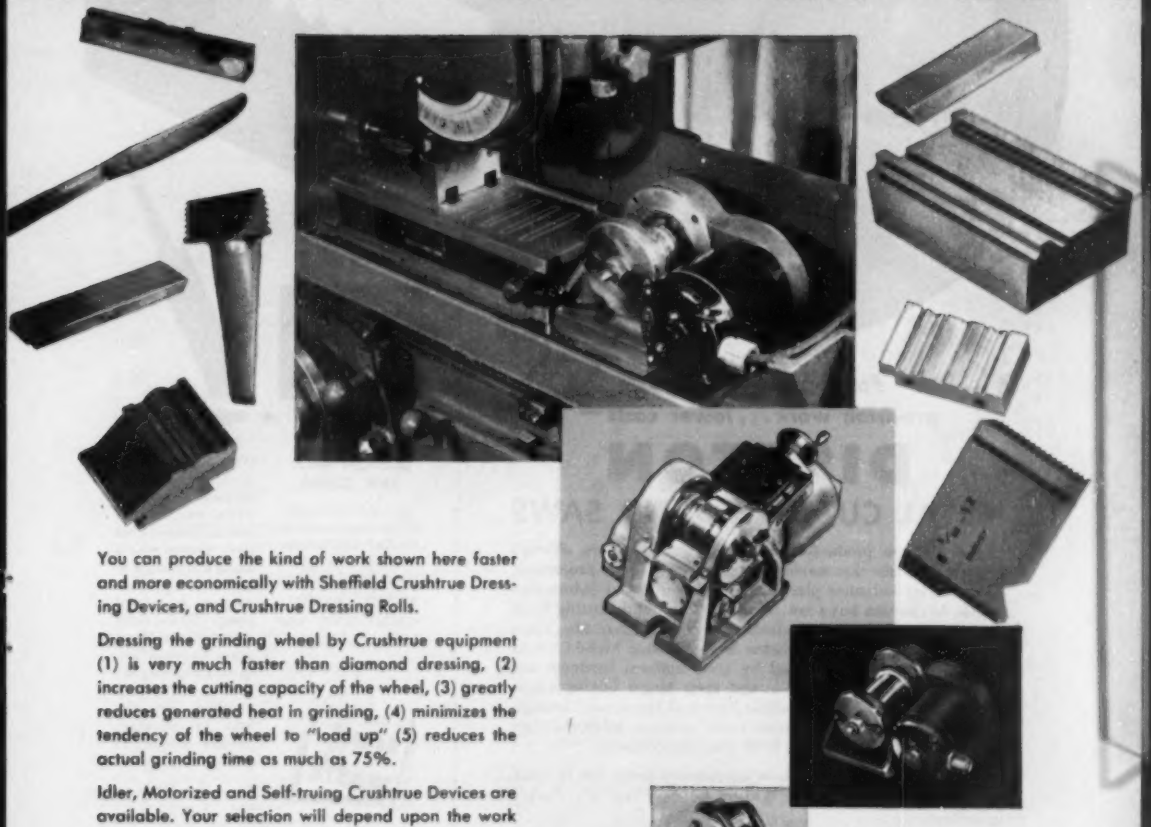
144th Winner:

(For December 24, '51 issue)

Robert Laimboeck

Attachment Cuts Grooves

Equip for Crushtrue Grinding to Speed Production and Cut Costs



You can produce the kind of work shown here faster and more economically with Sheffield Crushtrue Dressing Devices, and Crushtrue Dressing Rolls.

Dressing the grinding wheel by Crushtrue equipment (1) is very much faster than diamond dressing, (2) increases the cutting capacity of the wheel, (3) greatly reduces generated heat in grinding, (4) minimizes the tendency of the wheel to "load up" (5) reduces the actual grinding time as much as 75%.

Idler, Motorized and Self-truing Crushtrue Devices are available. Your selection will depend upon the work you do and the grinding equipment you have.

Crushtrue rolls for standard threads can be shipped immediately from a Sheffield "bank." Rolls for special forms for users engaged in long run production schedules can also be included in this stock on hand. Users send in rolls to be reground and immediately replacements from Sheffield's bank are forwarded at nominal cost. This relieves the user from the expense of ever having to buy new rolls.

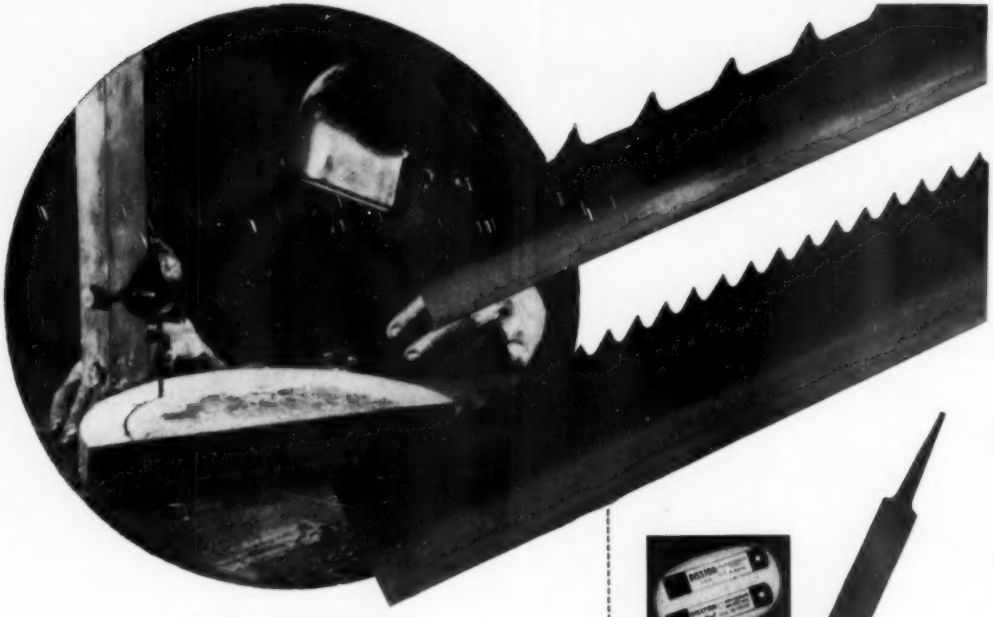
Write for information on the Sheffield "Crushtrue Roll Bank" and specifications on these Crushtrue Devices.

5678

the *Sheffield* corporation

Dayton 1, Ohio, U. S. A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS
CONTRACT SERVICES • THREADING TOOLS



For top production...
precision work... lower costs—

DISSTON
METAL CUTTING BAND SAWS

Higher defense production schedules demand more efficient production tools—for machine tool shops . . . metal processing, aircraft, and ordnance plants . . . in shipyards and automotive plants, to mention but a few. With Disston Metal Cutting Band Saws you get full speed production with longer tool life. Made from Disston Steel—with Disston Skill—Disston Metal Cutting Band Saws are characterized by their uniform hardness and temper . . . their toughness . . . and their longer lasting edges. Made in both Hard Edge Flexible Back and Hardened Throughout styles. Regular and Buttress Tooth patterns; tooth spacings, settings, widths, and gauges to fit your requirements.

DISSTON SAFETY REEL—Conveniently holds 100 ft. band saw coils reeled for safety. Widths from $\frac{1}{8}$" to $\frac{1}{2}$". Packed in cartons.

GET DISSTON METAL CUTTING BAND SAWS FROM YOUR DISSTON DISTRIBUTOR

He represents Disston in your territory—maintains complete stocks of Disston Metal Working Tools, and can fill your needs quickly and correctly.

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DISSTON HACK SAW BLADES

—for a wide variety of hand and machine cutting operations. Made in four types: HIGH SPEED STEEL; DIMOL; CHROMOL*; and DURAFLEX.

**Reg. U.S. Pat. Off.*

DISSTON MULTI-METAL FILES

Designed for the machinist who must regularly work on a wide variety of metals. Disston Files have special tooth shape and spacing to cut aluminum, brass, copper, iron, and steel. Double-cut sides with single-cut edges. Combine fast-cutting and long life with a minimum of clogging. 10", 12", and 14" lengths; packed one dozen to box.

In peace waste is a sin...
NOW—waste is a crime

A *free* service for industrial tool users. Individual instruction cards on 31 different cutting tools. Write for copy of "The Pocket Foreman" containing complete information.

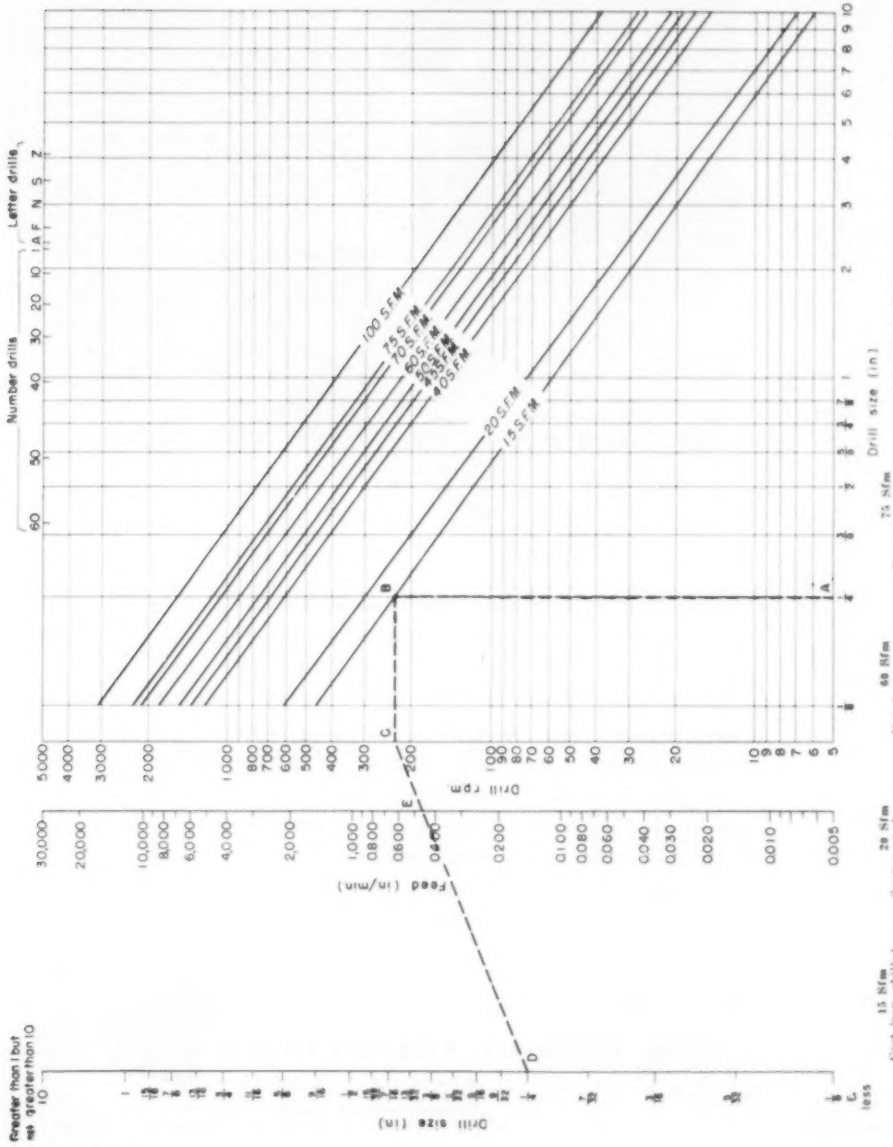
"SCRAP TURNED IN... IS STEEL TURNED OUT!"

Steel mills urgently need more scrap *now*. Help yourself get more steel by keeping your scrap moving into channels serving steel mills.

DISSTON®

Drill Speed and Feed Charts...I

BY J. H. LANDVATER, Engineer, NATIONAL STORE SPECIALTY CO.



Select drill size, as at A, move to B for selected sfm, go to C for drill rpm, then D for drill size again. At E is feed rate for numbered or letter drills. Find drill rpm as before, move up scale to 10 times value found, then to left to find feed in in. or mm. Feed intersects on feed scale and multiply by 10.

15 Sfm		60 Sfm	
Cast iron, chilled		Everdur	
Manganese steel, hard		Nickel steel, 3½%	
Manganese steel, 7-13%			
Manganese copper, 30% Mn		70 Sfm	
Tool steel		Copper	
20 Sfm		75 Sfm	
Spring steel		Pure nickel	
Stainless steel, CR			
40-50 Sfm		100 Sfm	
Cast iron, hard		Hard rubber	
Cast steel			

Dow Corning Silicones

hold electrical failures DOWN.. production UP

These silicone-glass spacer disks and tubes were installed 11 months ago. Switches have never required tightening and the silicone-glass laminates are in excellent condition. Plant engineers expect these parts to last several years. They have already repaid their original cost many times in increased production, reduced maintenance and down time.

These cotton-phenolic spacer disks and tubes were used to insulate the knife-switches on a 45,000 ampere graphitizing transformer. Operating temperature ranging from 400 to 500°F., converted the organic insulators to charred, cracked, shrunken conductors in less than 30 days. Constant shrinkage required daily tightening of switches. Replacement meant loss of an entire day's production.

Performance of the silicone-glass laminates described above is typical of all electrical insulating materials made with Dow Corning silicones. In fact, the tougher your operating problem the faster these remarkable materials pay for themselves. That's true of all silicone products including electrical insulating varnishes; oils and greases for special high and low temperature lubrication; protective coatings; water repellents; or, Silastic* seals and gaskets that remain flexible and resilient over a temperature span of 600° from −100 to over 500°F. They cut maintenance costs; step-up production.

Call our nearest branch office for technical assistance or write to Dept. AW-15

DOW CORNING CORPORATION

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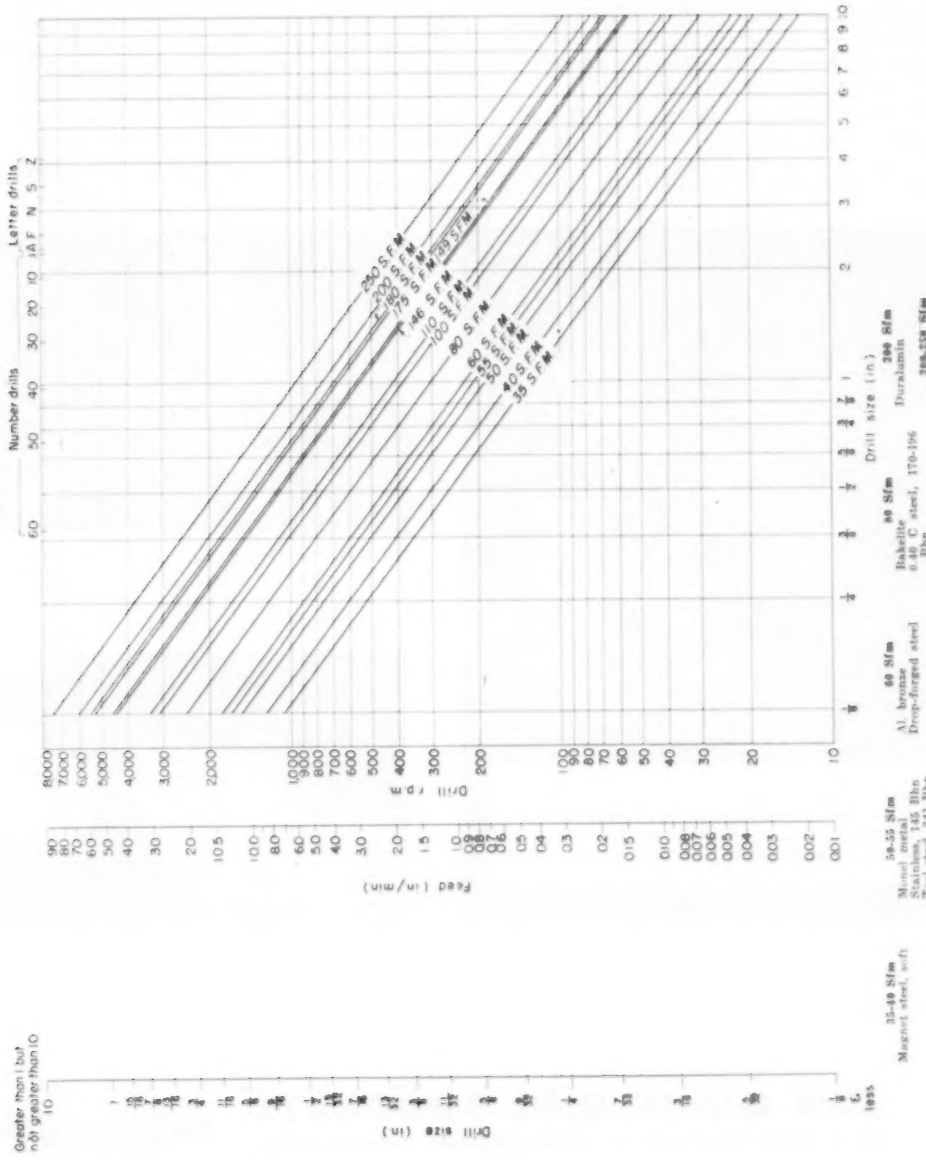
*T.M. Reg. U.S. Pat. Off.

Drill Speed and Feed Charts...II



5 METALS IN PRECISION-MADE REEL MACHINED WITH ONE SUNICUT OIL

The Ocean City Manufacturing Company operates Brown & Sharpe automatics on free-turning brass, aluminum, cold-rolled steel, phosphor and hardware bronze. Having used Sunicut Cutting Oils since 1941 with complete satisfaction, the plant decided a year ago to find out what other products could do. Numerous competitive oils were tested, and the best was selected for a long trial run.

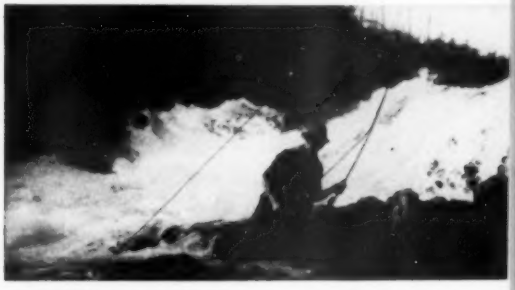
But this oil did not prove satisfactory in actual use. It caused the gibs to corrode and the slides to stick. Operators found miking difficult. Downtime and rejects grew to disturbing proportions. Finally, to protect its automatics and restore its production efficiency, the plant decided to go back to Sunicut Cutting Oils and standardized on Sunicut 11.

Sunicut 11 is a "Job Proved," dual-purpose cutting oil for automatic screw machines. Its transparency permits quick and accurate miking. Among its virtues is the fact it will not stain brass. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion. For other outstanding cutting oil case histories write for booklet AM-5.

MACHINE: Brown & Sharpe No. 2G • **METAL:** 11 ST aluminum
OPERATIONS: Feed stock, center drill, counterbore, recess and countersink, tap, form and cut off • **SFPM:** 800 • **SPEED:** 3,150 rpm
PRODUCTION: 250 collar housings per hr. • **CUTTING OIL:** Sunicut 11

MACHINING PARTS for Ocean City's "90" Automatic Reel. Sunicut 11 does not corrode the bronze gibs of the automatics, minimizes carry-off, makes miking easy. A coolant tried as an "economical" replacement failed on all three counts.

THIS AUTOMATIC REEL contains six types of metals . . . free-turning brass, aluminum, cold-rolled and stainless steel, phosphor and hardware bronze. Another Sunicut grade is used on the stainless steel.



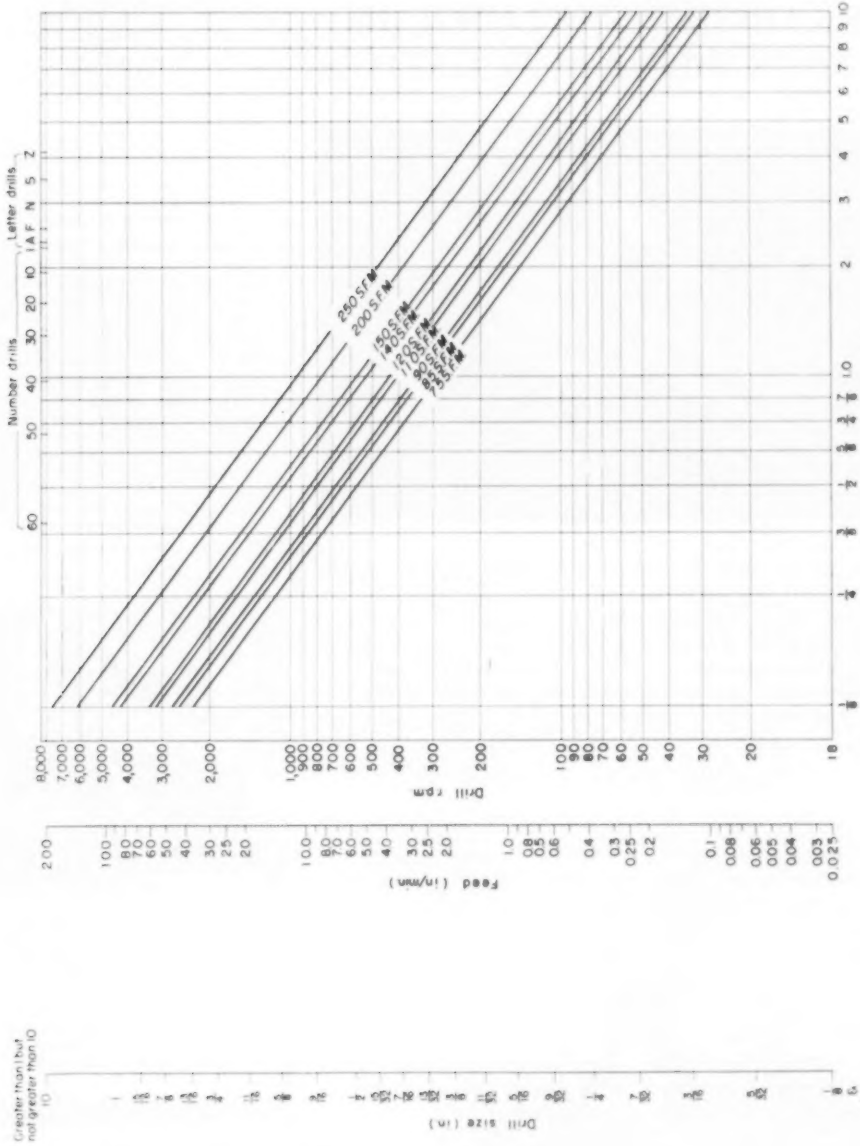
THE PRECISION PARTS that Sunicut 11 helps to make possible are put to the test as this top-quality reel goes into action. Little does the fisherman know how much of his pleasure he owes to a cutting oil.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

Drill Speed and Feed Charts...III

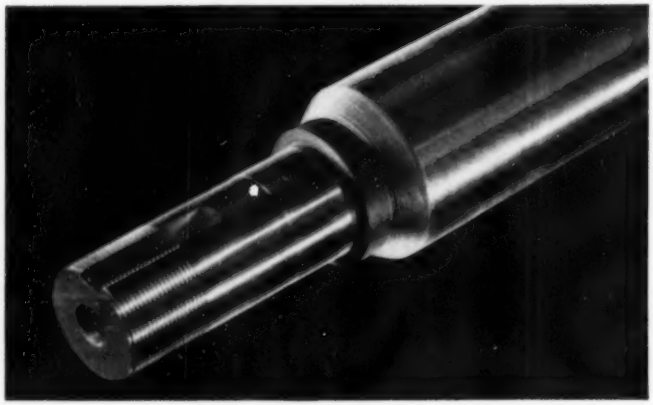


Production News

ABOUT *Lusol*—THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

4 TOOLS NOW DO THE WORK OF 18 WITH LUSOL IN THEIR MONARCH LATHES



This motor shaft is tough on tools. 18 a day were required until a 25:1 Lusol solution was put in each Monarch Lathe. Now they use only 4 tools per day for the same production and same fine finish.

Unusual? Not at all! Reports of greatly increased tool life, faster machining and better finishes are the usual thing where Lusol is at work. Plant managers tell us that, when they put Lusol in one machine, they soon have other operators asking for it. They like Lusol.

Rolling with Lusol

We never stop learning about Lusol. There are always production men with ability and curiosity trying it for new and different operations. Rolling sheet is one of these.

Testimony from a large brass company and a manufacturer of rolls convinces us that Lusol does more than ordinary rolling fluids. It prevents slippage. It carries heat away rapidly. Very evidently, Lusol maintains a continuous, tough film between the rolls and the sheet. This is not surprising, for we know that Lusol has extreme pressure characteristics. This means that Lusol prevents metal pickup. Rolls last longer. Sheet comes out smooth and free from deformities. Temperatures of rolling solutions have dropped 10°F. on the average. Worth investigating?

users say*

case histories of Lusol at work

A TOOL BUILDER—"Drill lands and flats stay sharp on deep drilling with Lusol, where we used to have a lot of trouble."

A ROLL GRINDER—"Eight hours grinding time, required for finishing four diameters in a step roll, was cut to six hours by changing to Lusol. And they improved the finish."

A GEAR MAKER—"Only four pieces were formerly produced before milling cutters had to be ground. The solution smoked badly. After changing to Lusol, 8 and 9 pieces per cutter are obtained, and the work remains cool."

A DIESEL ENGINE BUILDER—"Two Minster punch presses automatically feed steel strip, blank and pierce pole-piece laminations for electrical generators. A small stream of Lusol flows onto the strip as it enters the dies. Used to smoke up the place, but there's none now, and the parts come out clean."

(*Case histories of Lusol at work)

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 215B, Portland, Conn.

TALKING SHOP

Money-Go-Round

How MUCH does a twist drill cost? The Signal Corps pays 60 cents apiece, the Engineers 64 cents, and Ordnance (which uses more than the others) 72 cents. Armed Services Subcommittee members found that out, also several other items of particular interest. A carpenter's square, available generally for $1.97, cost the Engineers $1.48, the Navy $2, the Signal Corps $2.10, and Army Transportation Corps $4.35. The Navy bought 10-penny nails for 6½ cents per lb, the Engineers paid 8 cents, and the Air Force 12 cents. The Engineers paid 12 cents a lb for zinc-coated spikes, the Navy 9 cents.

Production Setup, 1902

STUDEBAKER, on its 50th anniversary in 1902, reported these physical assets: 312 iron-working machines, 683 wood-working machines, 6800 ft of lineshaft, 2000 pulleys on it, 7 miles of belting, 12 elevators, 1250 incandescent lamps, 235 arc lamps, 13 dynamos, 1550 horsepower used daily of a total of 2500 in 11 stationary engines. There were then 2500 employees—so there was a potential 1 hp per man, but only 3.5 hp was being used.

Sand Lubricant

SILICON PARTICLES, less than a millionth inch in diameter, show promise as thickeners for greases. This ultra-fine sand makes the grease stand up under heat in heavy service—when soap, the present thickener, breaks down.

Pushbutton Guard

NOW WE HAVE a cover for safety start buttons! The idea is a swinging plate on which is printed a reminder to check guards before starting the machine. The plate is pivoted so it must be pushed aside with one hand so the machine can be started with the other, thus making sure both hands are clear of moving parts.

Battery Daze

OPENING of the Pearl Street Station, or "electric factory," Sept 4, 1882, touched off a series of electrical inventions that averaged 3000 a year for many years. They came so fast that the Patent Office couldn't really invesigate inventors' claims. This led to patent warfare that went on until Electric Storage Battery raised millions in new capital in 1894, bought patent rights of principal competitors plus some 500 individual patents. Not until then could one buy a battery without danger of a lawsuit.

Incidentally, one "dental scientist" in 1890 used battery power to shock toothaches out of his patients' heads. In 1912, the first starting battery was put in the Cadillac—and killed the electric passenger car shortly afterwards. First electric materials-handling truck was made in 1906, but the first lift truck did not appear until World War I.

Automatic Safety

HAWAIIAN PINEAPPLE CO., Honolulu, has added a wrinkle to grinding-wheel safety. A pair of goggles, and one eye shield, are hung on pins over the grinder. One must be removed to start the machine. At the same time the worklight is turned on, and a sign, "Wear Your Goggles," lights up. Microswitches do the job.

Contract

ONE OF THE SIMPLEST contracts we've heard about was entered into in 1863 by two of the Studebaker brothers. Here it is: "I, Peter Studebaker, agree to sell all the wagons my brother Clem can make. (Signed) Peter Studebaker . . . I agree to make all he can sell. (Signed) Clem Studebaker." The company was only one of 5000 in the wagon-building business at that time—but in 14 years, its capital increased from $68 to $75,000, its labor force from 2 to 190, its assets from two sets of blacksmith tools to $223,269.06.

Music Hath Charms?

SEVERAL VISITS to plants in which popular music is considerably amplified so it can be heard over the noise of machines bring us around to the point of view of the 300 clothing workers in New York who went on strike for an hour in protest against the music that was supposed to keep them happy. We recently made an informal checkup in one of our own company departments, one not equipped with wired music, but one in which employees can use their own radios. It's our drafting department. There are four radios there, of all ages. Two are equipped with headphones; two are portables that blare discreetly. Major trouble is just what you'd expect: Most of the other draftsmen don't like either audible program, and the two men with headphones listen to still others. Encouraging note: One audible program is the UN, the other symphonic music, with no commercials.

News of Metalworking

STRONGEST 2-WAY STRETCH — The strongest two-way stretch in America—3 million lb total pull—has been ordered by Aluminum Co. of America. A new machine for straightening aluminum extruded parts will be installed at the firm's Lafayette, Ind., extrusion works about a year from now, for use in connection with Alcoa's new 13,200-ton extrusion press. Since extrusions often warp or curve during the manufacturing process, the stretcher will straighten extrusions up to a cross-sectional area of 60 sq in.

W&S MACHINE-TOOL SALES UP — Warner & Swasey Company's total sales for 1951 were $32,942,865, compared with $18,750,753 for 1950. The firm reported an employment gain of 23% during the year, with subcontracting contributing the equivalent of approximately 28% more employees. To round out production on three shifts, equipment worth $1,278,529 was purchased during the year. Backlog of machine tool orders at the end of 1951 represented from 19 to 20 months' production at the December rate, compared with eight months' at end of 1950.

Most Materials Controls Will Probably End Next January

WASHINGTON — Barring a new military crisis, the bulk of materials controls will probably end next January, a full year earlier than anyone had expected up to now.

Top metals experts now are advising mobilization heads that the U. S. can ditch the Controlled Materials Plan early next year. They recommend some lesser controls thereafter to give the armed forces the first crack at metals they need.

• **Top aides advise:** Go slow on government help for expansion of production of steel and aluminum. We've already provided for more of those two metals than the military will be able to chew up.

Reason behind the switched signals on metals controls is the recently stretched-out weapons building program which lowered scheduled peak rates for arms production and extended final delivery dates to mid-1955 instead of a year earlier. Controls officials now are sure there'll be ample steel and aluminum next January for military needs and most civilian uses, too.

Copper and a few other metals, like nickel and cobalt, will still be scarce. So government allocations of these probably will continue to be tough to make sure civilian users get a fair division of what is left after the arms program takes its cut. But even for these metals decontrol is in sight—almost certainly by 1954.

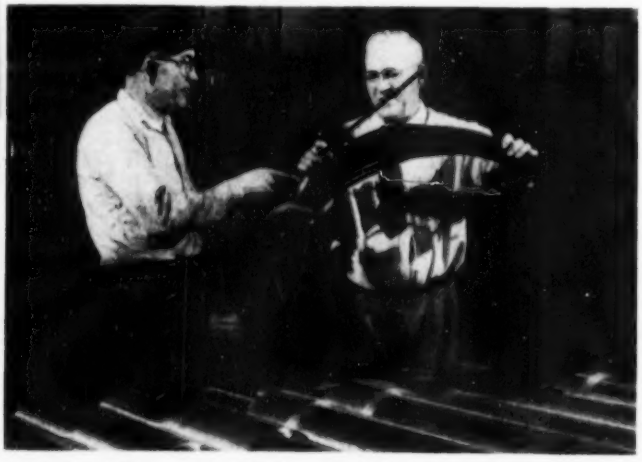
For aluminum and most types of steel the controllers are thinking in terms of a priority system something like that they used before CMP took over. This probably would provide a single DO, or other rating, for military use of steel and aluminum for end items and components.

• **Anticipated continuing shortages** of alloying metals — nickel, cobalt, manganese, etc.—may call for continued allocations of stainless and other very hard steels. But even these controls will be dropped when military demand for the metals passes the peak—probably sometime next year.

Restrictions on structural steel, up to now the scarcest form of that metal except stainless and plate, also are being eased. The lid stays on industrial construction for a while, but only because of the shortage of copper for equipping new plant.

Expansion of machine-tool production is in much the same boat. Some loans and fast amortization for new machine-tool plants are still in the bureaucratic mill, but they'll be about the last to get by. Reasoning is the same as on steel, aluminum: We have set up about all the tool capacity the military will need.

The same thing applies to new aircraft plant, except for some new facilities to turn out jet engines.



A ROLLED CHIP more than 170-ft long stands as an unofficial record at American Locomotive Company's Schenectady, N. Y., plant. Turned with a tungsten-carbide-tipped tool on a LeBlond heavy-duty finishing lathe, the piece was a diesel locomotive radiator-fan drive shaft with dia at base of cut 3¾ in. Feed was .031 at 150 rpm and depth of cut was 5/16 in. Outside dia of curl was 7/16 in. for the entire length. The steel was 1050 carbon, melt number 52336

Tools Transferred in Record Time

TRENTON, MICH.—The first production machine to be installed in Chrysler Corp's new engine plant here—a lathe used for machining flywheels—is in operation, exactly 48 hr after it was lifted from its base at the Highland Park plant for movement to Trenton. Some 14 machines in the flywheel and flywheel ring gear assembly of Dodge truck engines were transferred in one day. The entire transfer move involves 408 separate machines.

Employment Up In Metalworking

WASHINGTON — Employment in metalworking industries has been steadily increasing since December and is expected by employers to continue up through March, according to a survey made by the Bureau of Labor Statistics for the National Production Authority.

Employment in the 105 metalworking industries surveyed was 4,962,000 in January, an increase of 22,000 employes over December. This is higher than during any month since beginning of Korean hostilities.

• **The survey gives** an "accurate estimate of the impact of cutbacks in civilian production on the metalworking employment situation," according to Henry H. Fowler, NPA administrator.

The survey shows that even in the consumer durable goods field where material cutbacks were most severe, industry "has generally been able to find a means of maintaining and even increasing employment through substitution and conservation of scarce materials."

• **No new pools of unemployment** will be created during the first quarter in the metalworking industries, employers surveyed indicated.

There have been some bottlenecks in meeting schedules for defense production in a few areas which have created some local unemployment, Mr. Fowler admitted, "but the survey shows that "these temporary and occasional log jams have not created any over-all unemployment in the metalworking industries."

(For a visual picture of metalworking employment, see chart page 114.)

The complexity of modern arms production is indicated by this photo of the first operation of a jet-engine stopcock—or "carburetor"—body at Parker Appliance Co., Cleveland. Every station of the Warner & Swasey turret lathe is "manned" to finish the 17 surfaces of the main bore of the aluminum body casting. Operator uses 28 custom-made gages in checking his work. About 4000 precision jet-engine fuel-system valves and nozzles are turned out monthly by Parker in a separate Jet Engine Div. specially attuned to .0001-in. tolerances and finishes of 6-8 micro inches required in this work.

Start Work Toward Atomic Sub

SCHENECTADY, N. Y.—The Atomic Energy Commission has authorized immediate construction of General Electric's land-based prototype of an atomic power plant for submarines. The reactor will be located on the 4000-acre site owned by AEC in nearby West Milton.

Electric Boat Co. of Groton, Conn., is associated with GE as the submarine builder on this project, and is also serving in a similar capacity on a prototype reactor of different design being built by Westinghouse Electric Corp. in Idaho.

Quicker Settlement Now When Contract Ends

WASHINGTON — Defense contractors will now be able to clear their plants of government property and get their money settlements without months of delay.

New termination regulations of the General Accounting Office refine and tighten the joint termination regulation that grew out of the Armed Services procurement act of 1947.

Principal change was the elimination of the almost preferential treatment formerly accorded to subcontractors. Both primes and subs will have to prove costs with equal effort. Formerly, subcontractors were granted the benefit of doubt on cost allowances on the presumption that a termination worked greater hardship on the smaller subcontractor.

• **Specific examples of costs** that may be paid by the government under a termination of fixed price contracts are spelled out in the regulation. Thirty-one cost categories which may be included are listed. For example:

• The government may pay advertising costs of the contractor to the extent that they are reasonably allocable to the terminated portion of the contract. Rule of thumb would be that the percentage of advertising costs paid by the government would be consistent with the percentage of total business covered by the terminated contract.

• The government pays the claims of subcontractors that are common to the terminated contract.

• **In addition, government may pay:**

• Depreciation costs for the duration of the contract.

• Costs for plant protection measures.

• Costs of any leases necessary for performance of the contract less the residual value.

• Initial costs of a non-recurring nature that would have been absorbed if the contract were allowed to run its full life (like costs of training labor, or material costs caused by abnormal scrap losses that would have lessened as workers became more skilled).

• And materials and supplies, salaries and wages.

This is not the "firm, fast, and final" policy that Munitions Board Chairman John D. Small was demanding from GAO. But in effect it will do almost the same job.

GAO can still post-audit any termination of a contract where there is suspicion of fraud. But the Pentagon was talked out of writing into the regulation that all terminations would be "final and conclusive," although they did get a final policy in reality by a tightly worded and detailed regulation that leaves little for the individual services to spell out according to their own contracting policies.

CALENDAR OF MEETINGS

Mar. 17-21—American Society of Tool Engineers, industrial exposition; International Amphitheater, Chicago.

Mar. 18-19—Steel Founders Society of America, annual meeting; Edgewater Beach Hotel, Chicago.

Mar. 20-21—Pressed Metal Institute, technical meeting; Hotel Carter, Cleveland.

Mar. 24-26— American Society of Mechanical Engineers, spring meeting; University of Washington, Seattle.

Apr. 1-3—Steel Shipbuilding Institute, annual meeting, Palm Beach, Fla.

Apr. 7-9—American Society of Lubricating Engineers, annual meeting; Statler Hotel, Cleveland.

Apr. 17-18—American Machine Tool Distributors Association, spring meeting; Edgewater Beach Hotel, Chicago.

Apr. 24-25—Society for Advancement of Management and ASME, 7th annual Time Study & Methods Conference; Hotel Statler, New York.

Apr. 7-9—American Management Association, manufacturing conference; Hotel Statler, New York.

Apr. 29-30—Metal Powder Association, annual meeting and Metal Powder Show; Drake Hotel, Chicago.

Mar. 30-31—Packaging Machinery Manufacturers Institute, semi-annual meeting; Hotel Dennis, Atlantic City, N. J.

$2 MILLION MILL ORDERED — Westinghouse Electric Corp., Pittsburgh, has been awarded an order of approximately $2 million for the main roll and auxiliary drive electrical equipment for the Pittsburgh Steel Company's new 66-in. four-stand tandem cold strip mill at Allenport, Pa.

TO BUILD ALUMINA PLANT — A letter of intent for the engineering and construction of a $42-million alumina plant in San Patricio County, Texas, has been issued by Reynolds Metals Co. to C. F. Braun & Co., Alhambra, Calif.

350% Increase in Jet Output Due, With Piston Engines to Climb 80%

WASHINGTON — The swing from piston-engine planes to jets (see story page 219) will have a terrific impact on aircraft production. Production figures on output of planes and engines are secret, but experts in the field fit together pieces and come up with a general picture. Here's the way the speculation goes:

• **We're producing about 600** military planes per month now. The ratio of engine output to planes runs about five to one (includes spares, pipeline, overhaul needs). That means about 3000 engines per month. The ratio of jets to piston engines runs about two to one now, which means jet-engine output is hitting around 2000 per month.

The new "plateau" for the air build-up is put at about 1500-1800 planes per month. A ratio of five engines per plane means that engine output may be around 9000 engines per month. But the ratio of jets to pistons will be higher, probably three to one. So that means jet output could be around 7200 per month.

That's about a 350% increase over present jet production. Piston engine output, however, will rise only about 80%.

Then taking the cost of jets vs piston engines and you come up with still another slant. Biggest piston engines now run about $15,000 each. Jets cost about twice that much. Bigger production means cost cutting, of course, but anyway you look at it, the jet-engines business is now and will continue to be much bigger than pistons.

• **Company-wise there are big** changes, too. The piston engine industry was virtually a two-company industry: Pratt & Whitney Div. of United Aircraft Corp., East Hartford, Conn.; and Curtiss-Wright Corp., Woodridge, N. J.

But the Air Force isn't going to let itself be caught this way again. Already, there's a "big four" in jet production, and some other companies may be brought up to a rough equality with today's front-runners. The leaders today are Pratt & Whitney—the front-runner in jets as it is in pistons — Allison Div. of General Motors, General Electric, and Westinghouse Electric. Curtiss-Wright is coming up with its production of the British Sapphire jet engine, and another British jet supposed to be in the 10,000-lb thrust class.

Other divisions of the auto industry will be kept in production on jets in order to have a broad base ready for an emergency. For instance, Wright could handle about all the production the Air Force needs of the British Sapphire jet. But Buick Div. of General Motors will be kept in production of the same engine, just the same.

A citation for outstanding service to the nation and a life membership in American Ordnance Association is presented to Gen. Benjamin W. Chidlaw, commanding general of Air Defense Command, by Louis Polk, a director and vice president of AOA and president of Sheffield Corp., Dayton. Gen. Chidlaw served as commanding general of Air Materiel Command from 1949 to 1951.

PLANT EXPANSION NEWS

• **R. C. Mahon Company's** Structural Steel and Steel Deck divisions, the only divisions of the company remaining at the Mt. Elliott Ave. plant, have moved to the new plant at 6565 East Eight Mile Road at Sherwood Ave., Detroit. The Mt. Elliott Ave. plant was sold to Packard Motor Car.

• **Babcock & Wilcox Tube Co.** has transferred its assets and business to The Babcock & Wilcox Co., New York, and is now operated as the Tubular Products Div. of Babcock & Wilcox Co.

• **Flexoid Conveyor Co.** has been formed as a division of Smith Power Transmission Co., 1545 E. 23rd St., Cleveland. Flexoid will develop, design, construct and install conveyor equipment for diversified industries.

• **Heppenstall Co.** of Pittsburgh, is reactivating its Eddystone, Pa. plant to make die blocks for the Air Force expansion program. The 35-acre plant was built and operated by Heppenstall for the Navy in War II.

New home of National Screw Machine Products Association, at 2860 East 130th St., Cleveland, was formally opened Feb. 22. First of the association's committees to meet in the new home was the finance group shown above (left to right): H. F. Fischer, NSMPA president; Orrin B. Werntz, executive secretary; C. D. Hoyt Jr. (standing) former president; W. N. Grass, treasurer; Miss Margaret Ballinger, secretary; and S. P. Lancaster of Drexel Screw Machine Products Co., Chicago. At dedication ceremonies (photo at right), President Fischer presented to Hugo Lundberg (right) a gift in honor of his years in the industry, from which he retired Feb. 22.

Preference List Prepared for Tooling

WASHINGTON — A master preference list of defense items has been prepared by the Munitions Board and the civilian mobilization agencies for use by machine-tool builders. It would be followed in giving preference to one tooling program as against another. It would replace the present system which gives equal rating to all jobs, regardless of the relative urgency.

The hitch is that the Joint Chiefs of Staff have not yet been talked into approving the use of this master list. They say that the publicizing of such a list would be giving the Russians exactly the kind of information they want. If the list should be adopted, it would be necessary to distribute it to all prime contractors.

Up to now, it has been difficult for the three armed services to agree upon what machine tools are most urgently needed. Outside the machine-tool field, the services have done a little better. Each service has worked up its own urgency list. But, in effect, this meant that one item from each of the three services was in the top spot, the same for No. 2 spot, and so on.

If the Joint Chiefs can be pursuaded to endorse the use of the master list, it would be revised every three months. At the top would be the item most needed, whether it be jet engines, tanks or some special component.

INDUSTRIAL NOTES

Allegheny Ludlum Steel Corp., Pittsburgh, has changed the name of its sintered carbide production and sales units from Carbide Alloys Div. to Carmet Div. Carmet is the trade name under which products of the division are marketed.

The Abrasive Grain Association and the **Grinding Wheel Institute** are now both located at 2130 Keith Blvd., Cleveland 15, Ohio.

Atlas Chain & Mfg. Co., Philadelphia, has opened a New York office at 250 West 57th St., Room 829A., New York 19, N. Y.

Minneapolis-Honeywell Regulator Co. recently opened a new district office at Harrisburg, Pa., located in the Kline Village development.

National Radiator Co., Johnstown, Pa., recently entertained over a thousand guests from Altoona, Duncansville and Hollidaysburg, Pa., at an open house in the new Duncansville plant. The occasion was dedication of the new $1.3-million sheet metal fabricating plant.

DISTRIBUTORS NAMED

Ampco Metal, Inc., Milwaukee, has appointed Upton, Bradeen & James Ltd., Toronto, Canada, as distributor of Ampco Weld products.

Detroit Aluminum & Brass Corp., Detroit, has appointed W. C. Schonberg & Associates, Minneapolis, as factory representative in Minnesota, Iowa, North Dakota, and South Dakota. Joseph E. O'Hern was named representative for Illinois, Wisconsin, northwestern Indiana, and the Michigan upper peninsula.

Kurt Orban Co., Inc., New York, has been appointed sole U.S. distributor for the complete line of high-speed shapers manufactured by Kloppwerke Gmbh, Germany.

Sterling Electric Motors, Inc., has named the following distributors: Industrial Electric Co., Modesto, Calif.; Butte Machinery Co., Butte, Mont.; Pomona Electrical Machinery Co., Inc., Pomona, Calif.; Industrial Motor Electric, Woodland, Calif.; Meyer Bros. Co., Phillipsburg, Pa.; Transmission Equipment Co., New York.

FIRST REACTOR ENGINEERS — The School of Reactor Technology at Oak Ridge graduated its first regular class of 43 engineers recently. This establishes a new branch of engineering; one in which much of the subject matter is classified. Evening classes and summer courses in industrial centers are now being considered because of the urgent need for engineers familiar with reactor work.

BELGIANS AT TOOL SHOW—Four important figures in Belgian machine-tool manufacture are attending the ASTE Tool Show at Chicago Mar. 17-21. They are: Mr. Deletaille, general director, S. A. Mondiale, Brussels; Mr. Dutrannoit, Ateliers Dutrannoit, Charleroi; P. Raskin, Ateliers H. Raskin, Angleur; F. Wolff-Cammaerts, Syndicat des Constructeurs Belges de Machines-Outils.

Auto Workers Gained 30c hr Since '48; Manufacturing Average is 20c

WASHINGTON — Since the third-round wage increase of 11 cents an hour negotiated by UAW-CIO in May 1948, the union has obtained wage increases of 30 cents an hour under the General Motors contract providing for cost of living and annual improvement increases. Of the 30 cents, 19 cents has been for cost of living and 11 cents for productivity. In all manufacturing, wages have risen an average of 20 cents an hour.

Twice GM employees got wage cuts of two cents an hour—in March, 1949 and March, 1950—due to a drop in living costs. One other time, in June 1949, living costs dropped enough to cut the GM cost-of-living bonus one cent an hour, but a three-cent productivity increase at the same time resulted in a net increase of two cents an hour in wages.

• **This week's increase** of three cents an hour rounds out four full years of the GM escalator. The cost-of-living bonus today stands at 24 cents an hour. The contract has three more years to run, during which time—should living costs drop—not more than 19 of the 24-cent living cost bonus can be taken away. Over the same period, however, GM workers will get 12 cents more in productivity increases, plus what the C-of-L index may allow.

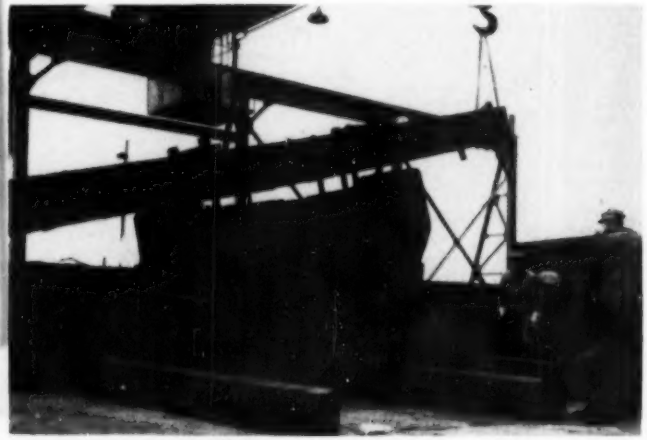
How does the 30 cents in wage increases, obtained by UAW-CIO under its GM escalator since the third-round increase, compare with what other unions and workers have got in higher direct wages without an escalator?

In steel, there has been only one direct wage increase of 16 cents an hour in Dec., 1950. (In 1949 the steelworkers got a company-paid pension plan.)

In coal, John L. Lewis got 8.75 cents an hour (besides 10 cents more per ton for the welfare fund) in March 1950 and, just before the wage price freeze, another 20 cents an hour.

• **In all manufacturing industries**, wages rose 20 cents per hour from Jan. 1949 (when the third round roughly was completed) until Dec. 1951, or from $1.37 to $1.57 according to BLS statistics on average straight time hourly earnings.

Some 80 national unions have escalator contracts with at least one employer.



80,000-lb hammer base (above) and a 15-ton body die (left) were turned up by Chrysler Corp. in a drive to collect and . . .

Scrap Obsolete Tools, Dies, Jigs, and Fixtures

DETROIT—In an all-out drive for scrap metal, Chrysler Corp. has evolved a unique system for collecting Chrysler-owned obsolete tooling held by its vendors.

After getting from its vendors lists of all Chrysler-owned tooling held, and finding out how long since tooling was used, these steps were taken:

1. Where several vendors make the same part, each holding duplicate tooling, all tooling except that held by one vendor is scrapped.

2. If that one vendor has two or more dies for the same part, all but one die are eliminated. And if that one die has several identical molds, all but one or two of the molds are scrapped.

3. When there is little call for a part, and when another current model die can be used to make the prior model part, tooling is scrapped.

Under this system, release of prior model tooling has reached a clip of nearly 1-million lb per month.

Edward W. Miller

Edwin R. Fellows, II

Orrin W. Barker

William J. During

Names in the News

Edward W. Miller, president, Fellows Gear Shaper Co., Springfield, Vt., has been elected general manager of the company. **Edwin R. Fellows, II,** has been elected a director and appointed assistant general manager. **Roger M. Knox** was named assistant to the president.

Christian E. Jarchow has been elected executive vice president, International Harvester Co., Chicago. He had been a vice president and will remain controller of the company. Mr. Jarchow has been with IH 38 years and in his new position succeeds **Gen. Levin H. Campbell,** retired.

George P. Luckey has been elected president, Hamilton Watch Co., Lancaster, Pa. Mr. Luckey was formerly vice president in charge of manufacturing and in his new position succeeds **Charles C. Smith,** deceased.

Carlton H. Winslow has been elected vice president in charge of sales, Cuno Engineering Co., Meriden, Conn. He was assistant general manager and has been with the firm for 18 years.

Carl A. Salmonsen has been appointed general manager, Industry Control Dept., General Electric Co., Schenectady, N. Y. Mr. Salmonsen, a GE employee for more than 42 years, had been manager of the company's former Large Apparatus Div. Other General Electric appointments include: **John C. Helies,** made general manager of the Appliance Control Dept.; and **Neil J. Curlee,** named manager of manufacturing, product service, Major Appliance Div.

Orrin W. Barker has been named chief engineer, Kearney & Trecker Corp., Milwaukee. Mr. Barker has been with the firm since 1925 and was named assistant chief engineer in 1936. He was formerly associated with Western Cartridge Co., Ingersoll Milling Machine Co., and Nash Motors.

John K. Beidler has been appointed general manager, Machinery Div., Dravo Corp., Pittsburgh. He was also elected a director and a vice president of Dravo-Doyle Co., a subsidiary. In his new position, Mr. Beidler succeeds the late **Walter P. Berg.**

Raymond S. Wood has been appointed general manager of Link-Belt Company's Ball and Roller Bearing Plant, Indianapolis, Ind. He succeeds **C. V. Loughery,** retired.

William J. During has been elected executive vice president, Precision Castings Co., Inc., Fayetteville, N. Y. Mr. During joined the firm in 1923 as chief engineer and production manager and in 1943 was named vice president and general manager. Precision also named **J. J. Punke, Albert Lintel,** and **Ross W. Castle,** vice presidents of the firm.

Louis F. Weyand, a vice president and member of the board, Minnesota Mining & Mfg. Co., St. Paul, Minn., was named executive vice president of the company. **Robert W. Young,** president of 3M's International Co., was named chairman of that organization's board. **Clarence B. Sampair** succeeded Mr. Young as president of the 3M subsidiary.

Howard D. Turner has been appointed superintendent, Lukenweld Div., Lukens Steel Co., Coatesville, Pa. He succeeds **E. Raymond McClung,** resigned.

OBITUARIES

Henry P. Merriam, 88, inventor and engineer, died Feb. 28 at Hubbardston, Mass. Before his retirement in 1930, Mr. Merriam had been with Continental Iron Works, Brooklyn, N. Y., as plant superintendent. He was particularly noted for his development work on fuses, bomb sights and heavy guns for the U.S. Armed Forces. During the last war he worked for Automatic Screw Machine Products, Gardner, Mass., in his small machine shop at his home, making very close tolerance parts for the Navy torpedo program, with a record of no piece ever being rejected by Navy inspectors.

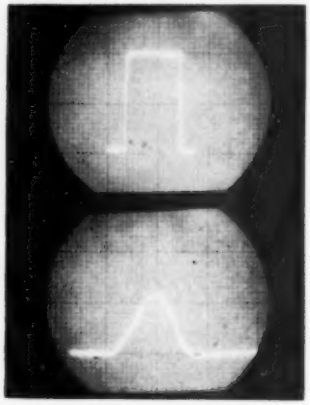
Otis L. Smith, president of Weldit, Inc., Detroit, died Jan. 28. Mr. Smith was a welding pioneer, having spent over 35 years in the industry. His original company was the Weldit Acetylene Co., established in 1918. He developed many welding products, notably the Weldimatic torch.

Morris E. Leeds, 82, founder and chairman of the board of Leeds & Northrup Co., Philadelphia, died Feb. 8. He was one of the best known men in the field of electrical instruments and automatic controls, and received many honors for achievement in that industry. Mr. Leeds was the inventor of the first balance-method industrial recording instrument, the Leeds Recorder, for which he received the Edward Longstreth Medal of Franklin Institute.

New Shop Equipment

Dieometer determines accurately and instantly the loads developed in a press under actual conditions

The meter at top shows the peak load developed; on the scope screen is the actual load pattern



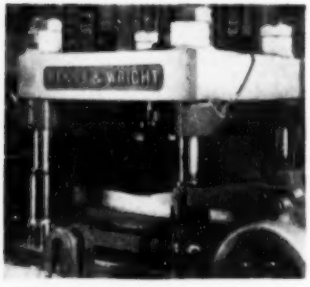
Photos of two load patterns were taken with a Polaroid camera which can also be purchased separately

Dieometer Flashes Instantaneous Press Loads

The Dieometer, an electronic instrument, accurately measures the loads occurring in power-press stamping operations.

Designed for use on Henry & Wright Dieing Machines engaged in progressive stamping, it eliminates dependence on theory in determining whether press capacity is equal to imposed loads.

Laboratory strain gages have been employed by skilled engineers for testing and die setting. The data so obtained, however, were not suited to determining die loads under operating conditions. At present, even die designers have to rely on calculations, perforce at variance with actual conditions because of variables in materials and die settings. No self-contained unit has been available for operation under production conditions.



Strain gages are permanently mounted on each of the guide rods and protected by cast-iron guards

By measuring the end result, the Dieometer takes die and material variables into consideration. It overcomes the problem of determining accurately and instantly the actual loads developed in the press under production conditions. It thus permits selection of the most suitable press for a given die design.

Specific features are:

1. Provides a continuous meter reading in tons of the maximum load produced during a cycle.

2. Shows on an oscilloscope, synchronized to press operation, the instantaneous load pattern occurring throughout the operating cycle. Each step is sharply defined by this pattern, which is centered on the scope screen.

3. Provides automatic shutoff based on instantaneous response to the value of loads developed in the press. (Friction clutch is required to affect this instantaneous shutdown when overloading occurs.)

4. Through a selector switch, it permits reading the sum of the total loads on the guide rods and the individual loading on each guide rod to determine if an eccentric loading condition exists and to what extent.

5. Includes a counter that automatically counts only the number of pieces produced. This counter can be set to operate at any desired loading and will not register when machine is "cutting air" or operating below predetermined loads.

6. Furnishes the means for making a photographic record of the calibrated load pattern shown on the oscilloscope during the operating cycle. The oscilloscope will accomodate a Polaroid camera which can be supplied with the equipment or purchased separately. This photographic record allows leisurely study and analysis of loads developed in the die.

7. The Dieometer is constructed to function accurately and withstand the shock conditions normally prevailing in the vicinity of presses operating at high speeds.

Dieometer Operation

Strain-gage bridge feeds directly into an amplifier. The output of this amplifier actuates a thyratron connected to the clutch, causing the press to shut-off when an over-load occurs. It is important to note that this arrangement is connected directly with the overload itself and not through a chain reaction of inertia elements from the main power source.

Materials and Parts

Operating concurrently with the unit is a synchronous switch that feeds the signal to the oscilloscope. The signal is timed so that the full load pattern appears in the center of the high-persistance scope screen.

As the functions listed above indicate, the Dieometer makes possible fundamental improvements in metal stamping operations. It promises to be invaluable in studying the intial running of a new die in a dieing machine. The user will be able to determine, from the finished part and stock hardness, what the normal load is in the die and how it compares with the capacity of the press.

At the same time, the Dieometer will reveal eccentric loading, disclose whether it is within practical limits and suggest a redesign if such is necessary to bring loading within desired boundaries.

Once the tonnage of a die (which includes stock hardness as a factor) has been recorded on the Dieometer, it is available as reference information for several purposes. It will facilitate subsequent setups for re-running the same job by enabling the operator to make his connection adjustments to reproduce the recorded tonnage for the die, thereby ensuring exact duplication of the previous setting.

It can also be used to determine when the hardness or softness of stock exceeds predetermined limits and will show the degree of dulling of punches or dies, which is reflected in increased loads.

Another use of the standard load measured for a given die is in determining the cut-off tonnage at which it is desirable to have the Dieometer stop the press electronically. Still another use is as a guide in establishing the specific setting that will ensure operation of the counter.

Installation and use of the Dieometer is fairly simple. The strain gauges are mounted permanently with guards on each guide. They do not interfere with removal of the upper crosshead. The unit is wheeled into position and its cables are connected to the gages by convenient plug-in means. The cables can be readily disconnected when it is to be transferred from one press to another.

Operating on a 110-volt circuit, the components are housed in a gray metal cabinet. All controls necessary for operation by non-technical personnel are readily accessible. Basic controls, however, have a disconnecting interlock and can be serviced only by engineering personnel.

Henry & Wright Div., Emhart Mfg. Co., Hartford, Conn.

Special Auto-Collimator for Fast Angular Setting and Checking

The instrument is a special type of auto-collimator revolvable with reference to a precision-graduated circular scale to facilitate fast setting and checking of angles. When the target lines of the instrument are centered the device is set at right angles to a reflecting surface. Calibrations are to one-half minute of arc, but it is possible to set the device visually to at least 10 sec per arc.

It is used for such diverse applications as a variable angle target for setting up optical reference lines, for checking flatness of long surfaces such as lathe beds, for checking parallelism of surfaces such as gage blocks. It is particularly adaptable to check small surfaces in inaccessible locations such as valve seats, milled insert faces and similar surfaces which are extremely difficult to check by any other method. One of the most valuable possibilities is the ease, speed and accuracy with which repetitive inspection of angular faces on small or large parts can be made.

Optical Div., Safe Flight Instrument Corp., 4 Water St., White Plains, N. Y.

...INCLUDING

Simultaneous chamfering and burring of hypoid pinions is done by pushbutton at rate of 900 per hr. page 176

Hydraulic press tests rocket motor bodies 600% faster, exerting 25,000 psi. page 177

Cylindrical grinder has a graduated wheel-feed handwheel to ease operation. page 178

Rotary face grinder has tilting work and grinding spindles and hydraulic operation. page 178

Electronic production gage has an amplifier meter which shows how far off size the work is. page 180

Drawn-shell trimmer also beads, knurls, and forms in one work cycle. page 182

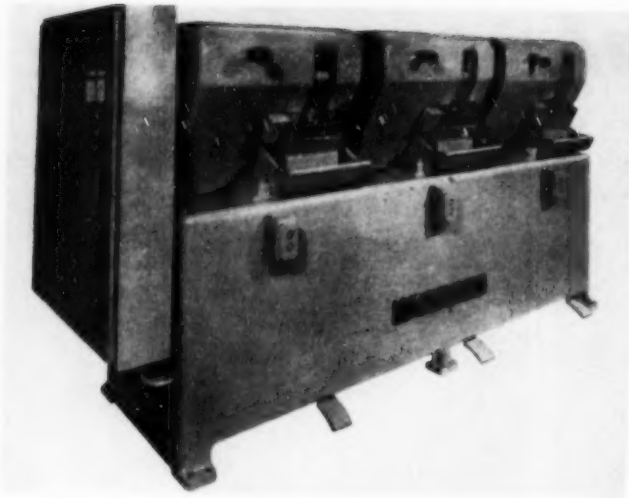
Hand lift truck handles both pallets and skids by easy adjustment. page 188

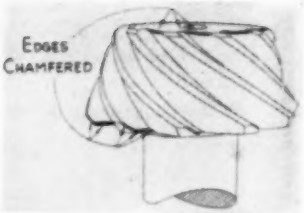
Instrument lathe will turn or bore within 0.0001 in. in 6 in., has 8½-in. swing..... page 194

...and in March 31

High-speed planer bevels steel plate prior to welding, handles material 40 ft long, uses dynamic braking.

Fractional-hp motors cut down 50% in weight of previous models, have extra-long-life insulation.





Pinions are simultaneously chamfered on the acute side and burrs and sharp edges removed on the profile and considerable part of root on both toe and heel. The peripheral chamber on the large end is also deburred

Three station Burrmaster simultaneously chamfers as many as three different hypoid pinions of different dimensions—one in each station. Their three stations are identical except for detail tooling and ratio of change gears

Chamfer 900 Pinions per Hr Automatically

These burring and chamfering machines for hypoid pinions have the following features:

1. Output rate of up to 300 pinions per hr per station per machine. Available in 1-, 2- and 3-station (illustrated) models.

2. Simultaneous chamfering and removal of burrs. Takes up to three pinions of different dimensions.

3. Elimination of skilled operator. No pre-locating by operator.

4. Push-button operation with safety interlocks and automatic gaging.

5. Minimum down-time by use of extra-long-life tooling.

6. Universality due to simple change-over for pinions of different tooth numbers and diameters.

7. No coolant required.

8. Hydraulic and air mechanisms eliminated.

9. Minimum loading time. Clamping of work is eliminated.

Each station is independently operated. The operator merely places a hypoid pinion—shaft end down—into the opening provided and throws the drive lever to start the cycle. An oversize pinion will not drop in all the way. An undersize pinion or one with the wrong number of teeth will not permit the automatic gaging device to start the cycle. Thus the machine protects the operator against errors.

As soon as the cutting cycle has been completed—a matter of only four seconds—the "cycle indicator light" goes on. The operator then pulls the release handle (shown above and to the left of each station) and steps on the ejector pedal. Depressing this pedal while the machine is still running (before the cycle is completed) will not eject the part due to a safety interlock.

The fixture plate surrounding the large end of the pinion and the tooling on the rocker arm above the pinion are the only non-standard parts at the station. They may be readily interchanged as complete assemblies to set up any station for a different pinion. Radial adjustment of the part in relation to cutters is provided.

Built into the lower side of the fixture plate is an automatic electric gaging device with an electric interlock with the machine cycle which prevents the machine from starting if the pinion is of the wrong size. This gaging device is adjustable to permit its being set to handle pinions with varying amount of stock on the OD within the desired range.

In addition to these interlocks, the drive from the electric motor is provided with a positive-action clutch having an adjustable overload relief. Accidental overloads due to unanticipated conditions will cause the clutch to slip, preventing damage to machine parts. Need for shear pins, etc., is eliminated.

Another safety feature is that the tools always stop in the retracted position for ease of loading and avoidance of tool damage.

The operator is not required to locate or clamp the pinion in the holder. Index locating is automatic and no clamping is necessary due to the design of the machine and the method by which it operates.

The HSS cutting tools used are specially developed dovetail form tools with extra-long life. When regrind is necessary, tools are reset in the machine without gaging, merely bringing them against a stop bearing on the tool face. In sharpening these tools, relief grinding is not necessary, making several hundred grinds per tool possible.

Cutting is dry, eliminating the need for coolant. Depth of cut is readily adjustable for the single generating stroke required to burr and chamfer a tooth. Indexing of the pinion from tooth to tooth is automatic during the return stroke of the tools. This permits a rate of up to 5 cutting strokes per sec.

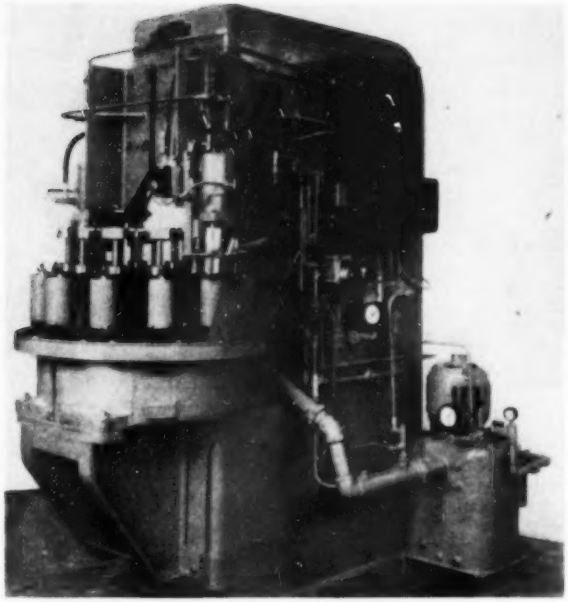
Lubrication of change gears, bearings, clutch parts and other reciprocating movements is by a central lubricating system for ease of maintenance.

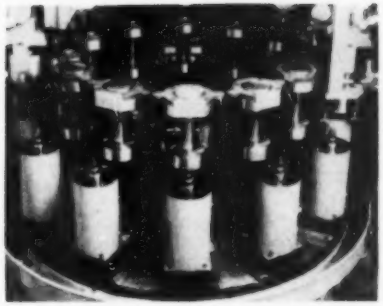
All electrical equipment is built to J.I.C. standards. Automatic interlocks actuate machine and automatically release locks in proper sequence.

Each station is provided with a built-in chip disposal chute. Automatic chip disposal is available if required. Floor space is 44½ in. deep by 92 in. long.

Patents have been applied for.

Modern Industrial Engineering Co., 11230 Birwood, Detroit 4, Mich.





12-station index table moves at speeds that are adjustable to the operator's ability to load or unload the parts. Various stations automatically screw the part into the fixture, remove air from the body, test and mark the part

Ingenious tooling has rigged out this standard Denison Multipress to test bazooka-rocket motor bodies. Two automatic wrenches are used—one to tighten the work into the fixture after the operator has hand "caught" it a few turns, the other to unscrew it after test completion

A 15-Ton Denison Multipress, Exerting 25,000 psi • • •

Tests 3.5-In. Rocket Motor Bodies 600% Faster

The motor body is exposed to a pressure of 25,000 psi for a full two seconds, and the test is conducted at the rate of 600 per hour. This is approximately six times faster than previous methods with a great saving in manpower required to operate the equipment.

The motor body is threaded into each fixture by the operator until enough threads are "caught" to allow it to be automatically turned-in at a succeeding station. The inspection mark on the neck of the body is made by an automatic punch that is so designed that it marks only the bodies that withstand the test. This automatic inspection saves time, and one operator can load and unload parts as well as inspect them. To unload, only a couple of turns are necessary to release the part after the automatic wrenching station has been passed.

The hydraulically driven, 12-station index table moves at speeds that are adjustable to the operator's ability to load and unload the parts. A knurled knob regulates the speed by varying the oil flow. Turning this knob to the right or left increases or decreases table speed immediately.

The automatic wrench that turns the parts into the fixture is made up of a hydraulically operated collet chuck and a Denison Fluid Motor Drive. The wrench is advanced to the fixture by a cylinder and, upon contacting the part, begins to turn it. Each action of the wrench is electrically controlled by solenoid and limit-switch control. The fluid motor is hydraulically powered by the pumping unit of the press and rotates at controlled speeds.

At the next station the fixture is filled with oil to remove all air from the chamber prior to the actual test operation. This filling device is also advanced by a cylinder in sequence with the operation of the table.

By eliminating the air, it is possible to maintain a constant working pressure of 25,000 psi on each motor body. This oil is supplied by a separate pumping unit.

The press ram descends at the next station, exerting force on the plunger of the fixture, with a two-second dwell at full pressure during each cycle. This dwell period is electrically timed by a standard Denison time-delay accessory.

At this same station the marking tool snaps forward to stamp the motor body if it successfully withstands the test. In the event that the part does not hold pressure for the required two seconds, the ram will continue downward, contacting another limit switch that automatically lights a light, stops the machine, and blocks the electrical circuit that controls the marking punch. From this station the fixture indexes to a counterclockwise wrench at the next station.

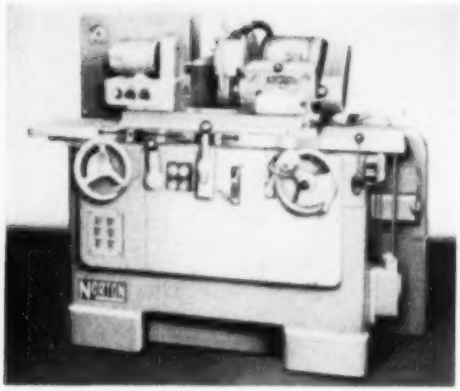
Safety Features

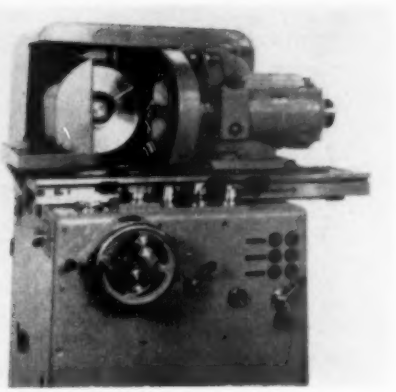
Every possible precaution has been taken, for both the safety of the operator and the machine, to eliminate accidents that would break tooling or be hazardous in any way. If the part is not properly positioned on the fixture, an electric light enclosed in a wire enclosure on the head of the press flashes on, and the machine stops. The trouble must be corrected and a key switch depressed before the machine will resume operation.

This test is primarily made to check the holding qualities of the threaded motor body. It is necessary to have the part correctly threaded into position. Any failure of the preceding wrenching station is automatically reported.

The press, accessory equipment, and the hydraulically driven index table are all standard components.

The Denison Engineering Co., Columbus, Ohio





Norton 4-in. Cylindrical Grinding Machine for Small Parts

This 4 in. Type CTU cylindrical grinding machine is available as a plain machine, or as a semi-automatic in work-length capacities of 12 or 18 in.

The machine provides extraordinary operating ease. Wheel feeds and job setups are simplified by a graduated wheel-feed handwheel. The graduations indicate the amount of feed as the handwheel is rotated past a fixed pointer. A click-count indexing mechanism on the handwheel provides the advantages of making fine feed settings by feel rather than by setting an index pin in a target. This mechanism clicks a detent on rotation of its control knob, each click representing the setting for 0.0001 in. work-diameter reduction.

Grinding and truing table speeds are independently adjustable, and are quickly obtained by positioning the table start-stop lever. No resetting of speeds is necessary when changing from one speed to another. Extremely smooth and slow table speeds are available for truing the grinding wheel due to well-lubricated base ways and complete guarding of the ways by fixed table extension guards.

Automatic or manual control of work rotation and coolant flow is also provided. A selector switch gives the type desired. Automatic adjustable wheel feed at table reversals with automatic reset of the wheel head, and separate dwell controls for each end of table travel are features that permit traverse grinding with a minimum of effort. Controls for speeds and feeds are conveniently positioned in the operating area.

The semi-automatic version provides an automatic adjustable grinding cycle which is controlled by movement of a single lever. This simplified form of control permits the operator to devote a major share of his attention to loading the machine. Movement of the selector lever converts the machine for traverse grinding during which the automatic cycle functions.

Norton Co., Worcester 6, Mass.

German Rotary Face Grinder Uses Short Grinding Cycle

In this Reinecker rotary face grinder from Germany, both the work spindle and the grinding spindle can be tilted around their vertical axis, making it adapatable to the grinding of gear-shaper cutters, saw blades, shearing knives and similar parts. It is said to be equally applicable for grinding space rings, pump wheels, disc control valves, etc.

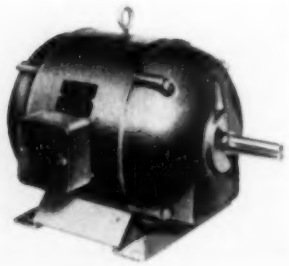
The workpieces can be chucked within a range of ½ to 10-in. dia. to 6 in. in height by magnetic, collet or jaw chucks.

Special feature of the grinder is the semi-automatic grinding of hidden surfaces. For this purpose the work-spindle compound is moved hydraulically.

Short grinding cycles and high efficiency are made possible by the use of a 10-in. dia., 4/5-in. grinding wheel and rugged bearings. Sparking-out period is adjustable and the spindle can be adjusted within 0.000039 in. for correction purposes while the machine is working. Tolerances from face to face of the workpiece can be held within 0.00004 in. to 0.00008 in. depending on the operation.

Imported by:

Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.



Motor Line Expanded to Include 125-hp Ratings

Four sizes to 125 hp supplement R&M's regular line and are designed for all-weather operation, with special treatment to resist moisture and corrosion.

The rotor assembly is treated with a special rust-inhibitor and the cast-iron end heads and terminal box are cleaned and given an anti-corrosion treatment of zinc chromate.

End-to-end clean-sweep ventilation eliminates converging air currents that deposit dirt. Auxiliary air passages in the rotor core assembly enable the air to circulate through the rotor as well as between the windings and the shell. The motor ratings will be made in NEMA frames 444, 445, 504 and 505.

Robbins & Myers, Inc., Springfield 99, Ohio

High-pressure springs have been designed for all die applications and general machinery use. The drawn high-carbon oval wire permits a deflection of about 30% where maximum load rate and normal movement are required. Springs work in hole diameters from ¾ to 2 in.; over rod from 21/64 to 15/16 in. Free lengths are cut to exactly 1½ to 12 in. with ends closed and ground square.

Producto Machine Co., Bridgeport, Conn.

Get the most out of your

LELAND-GIFFORD DRILLING MACHINES

Watch those STOP NUTS...

On machines equipped with power feed, never use stop nuts on the depth screw. Provision for accurately setting the depth of feed is built into the power feed mechanism. The use of stop nuts on the depth screw above the sliding head can result in serious damage to the spindle or power feed mechanism.

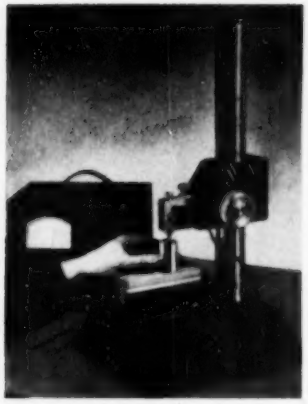
A small point? Yes...but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them ...with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

SAVE TIME **— CONTACT THE OFFICE NEAREST YOU**

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Electronic Production Gage Measures in Fractions of an Inch

The Par-Ac electronic production gage is said to be a high-precision shop instrument for repetitive dimensional gaging on long-run, short-run or toolroom work, in definite fractions of an inch.

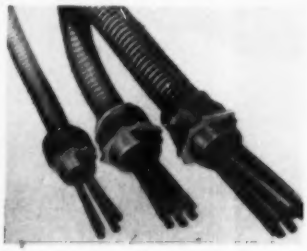
It consists of (1) an induction-type gage head mounted on a stand and (2) a high-stability 4-tube amplifier. The gage head is set to the required dimension and a meter on the amplifier shows how far off size the work is, either side of zero, on either of two continuous linear scales. Standard amplifiers read 0.0005 and 0.00005 or 0.0001 and 0.00001 in. per scale division; and full scale readings are plus and minus 0.005 and 0.0005 or 0.002 and 0.0002 in. respectively.

The two scales can be used interchangeably at will, and both scales always give the same reading for any measurement within their range. Meter response is instantaneous, without overshoot, permitting fast readings.

A frictionless movement, with no mechanical amplification, is used in the gage head. The amplifier is free of drift, and readings are not affected by near-by magnetic fields or by any ordinary changes in line voltage or temperature of gage head. Consistent repeat readings are obtained at all times. The work is placed on an anvil mounted in a holder on the stand, with the anvil either parallel or at right angles to front of base. The gage head is positioned vertically by rack and pinion, and accommodates work of any height to 8⅜ in. above top of anvil. Fine adjustment of 0.040 in. is provided by a knob on the gage head with 0.006 in. per turn. Throat clearance is 3⅜ in.

One amplifier can be arranged to serve several gage heads and with appropriate fixtures, the equipment can be used for multiple gaging. Other features include 4-oz. contact pressure, replaceable contact tip, and 50-sec. warmup.

Graham-Mintel Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio



Pressure-Control Tubes Grouped in Protective Cable

Armortube cable, a flexible, protected multi-tube transmission line consists of bundles of ¼-in. aluminum or copper tubing, gathered in a slow continuous spiral similar to the construction of rope, and encased in heavy, rust-resistant, galvanized-steel strip like that used for BX electrical cable.

Available in bundles of 4, 8, and 12 tubes, the cable has been designed to: (1) cut installation and time costs; (2) save critical material; (3) protect pneumatic and hydraulic pressure-control lines, conserve space and improve plant appearance. The method of grouping pressure-control tubes within a protective cable is said to eliminate the use of expensive support-racks and troughs which are now in common use.

The cable is shipped in returnable reels in random lengths of approximately 500 ft.

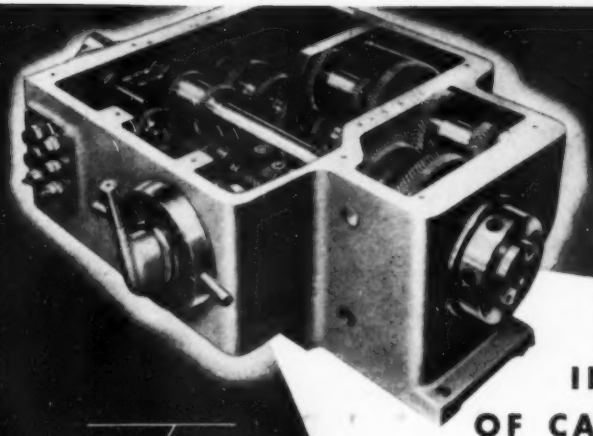
Bailey Meter Co., 1052 Ivanhoe Rd., Cleveland 10, Ohio

Combination Rack and Box has Capacity Up to 5000 lb.

The rack is made for handling miscellaneous products and has the following tiering feature — tubular corner posts and deep-drawn nesting caps on each leg. Rack posts are punched with four slots and can be equipped with side bars made so that they are flush with corner posts. Bars are also made to extend out from the sides in order to retain parts wider than the rack. The side bars are joined to, or removed from the sockets of the tubular side posts by tilting. When engaged the bars cannot be jarred out of the sockets.

American Sales Engineers, 141 West Eight Mile Rd., Detroit 3, Mich.

A VACUUM PRINTING FRAME for producing photographic metal templets eliminates the laying out of the design on the templet by hand. The top of the machine is counter-balanced. It is equipped with a bank of instant start, slim-line fluorescent tubes which assure quck, even exposure. Continuous operation is possible with no overheating of the machine. Over-all printing area of the machine is 60 x 144 in. — *Miller-Trojan Co., Inc., 1083 W. Main St., Troy, Ohio*



Sidney Lathes

INCREASE LIFE OF CARBIDE TOOLS

The continuous tooth contact of Sidney's All-Herringbone Geared Headstock produces a smooth flow of power and creates pressure of constant intensity on the cutting tool . . . This constant pressure is especially desirable when using carbide tools by preventing tool breakage caused by shock or intermittent pressures.

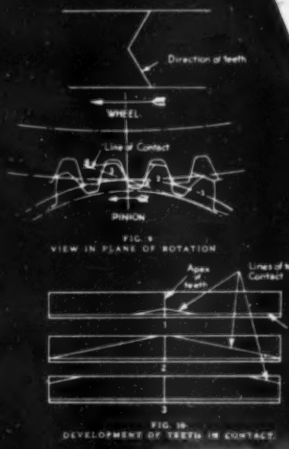
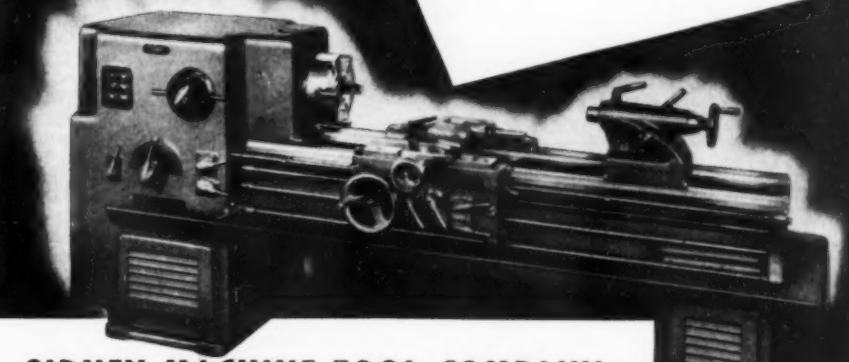


FIG. 9
VIEW IN PLANE OF ROTATION

FIG. 10
DEVELOPMENT OF TEETH IN CONTACT

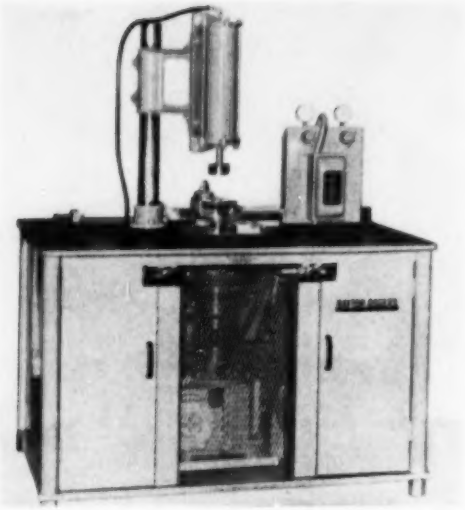
Illustrated at left is the nature of contact between two herringbone gears. Pressure is evenly divided over three teeth with no tendency for tooth contour to wear unevenly. Full descriptive bulletin available.

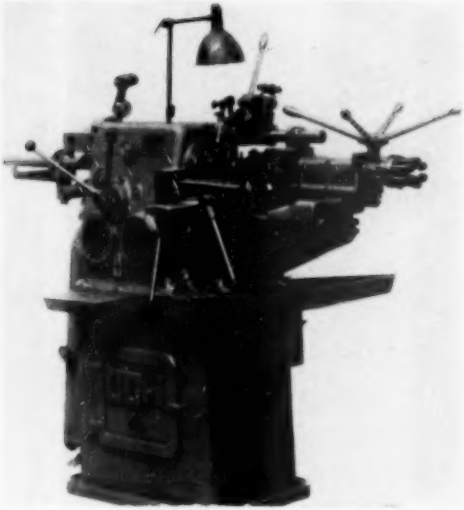


SIDNEY MACHINE TOOL COMPANY

Builders of Precision Machinery Since 1904

SIDNEY, OHIO





Universal Drawn-Shell Trimmer Also Beads, Knurls and Forms

Model ST-2 Trimmer is capable of trimming square, rectangular, round or irregular-shaped shells. It also beads, knurls and forms with all operations completed in one work cycle. Tooling-up time for the machine for any given shell is said to be relatively inexpensive.

Forming, beading and knurling operations are readily adapted to the shell trimmer by replacing the standard external cutter with a special master roll as required for any given job. Flanged shells can also be trimmed by providing a special external cutter. Operation of shell trimmer uses an internal cutter and profile mandrel mounted on a driven-work spindle. The external cutter is then adjusted for vertical height to allow normal clearance between the two cutting edges similar to an ordinary blanking die. The shell to be trimmed is then placed on the mandrel and is held in working position by a vertically operated air cylinder. The external cutter is mounted on the sector gear which engages an air-operated rack.

This design permits the external cutter to follow the contour of the profile mandrel maintaining uniform engagement regardless of size or shape of the shell. A hold-down cylinder and power cylinder are operated through air valves located at the front of the machine. The valve operating the hold-down cylinder is so arranged that when the pressure is released on the cylinder, a blast of air is injected through the center of the work spindle which strips the shell from the internal mandrel.

The hardened alloy-steel work spindle is provided with keyway and arbor nut for fastening mandrel into working position. A 6-ft drive permits correct rpm for any given job. Shifting of gears is done through a door on the right side of the machine. A heavy-duty speed reducer assures smooth flow of power from the motor to the work spindle. A large storage tank prevents built-up pressure and power cylinder and keeps pressure uniform.

The unit is 54-in. wide by 36-in. long, height is 33½ in. Motor used is 3 hp, 1750 rpm. Work spindle speed operates from 5 to 40 rpm. Max stock thickness it will take is 0.093 CRS or to 0.062 in. in stainless.

Dayton Rogers Mfg. Co., Minneapolis 7, Minn.

Fire extinguisher with one quart capacity is said to remain free from corrosion by the use of a corrosion arrestor which purifies the liquid. The extinguisher meets requirements of Board of Railway Commissioners and Interstate Commerce Commission for use on motor trucks, trains and buses. Ideal for on-the-spot protection in factories, for fighting gasoline, oil and electrical fires. Underwriters' rating is B-2, C-2.

General Detroit Corp., 2272 East Jefferson Ave., Detroit 7, Mich.

Hand-Feed Turret Lathe for Precise Machining of Short Runs

The Hestika Model HR 26 turret lathe, made in Germany, has been designed throughout for accurate small volume work rather than to handle mass produdction, and for that purpose uses a hand-operated feed. The short throw turret hand feed makes it possible, economically, to achieve short machining cycles in the production of formed parts from bar stock, turning of cast or pressed components, as well as finishing and second operations on pre-machined work. The turret can be used with 3, 4, 5 or 6 tools. One or more drilling spindles may be set up on the turret tailstock for small, accurate holes.

A single lever control is used for chucking forward and reverse spindle speeds, tracing speeds and stopping of headstock spindles.

Interchangeable attachments for the lathe permit carrying out of practically all machining operations, including parallel turning, facing, form and taper turning, drilling, thread cutting and chasing.

It has a bed length of 23½ in. and a maximum collet capacity of 1 in. Spindle speed ranges are: high speed, 390 to 2400 rpm; thread cutting, 43 to 270 rpm; reversing 130 to 800 rpm. Speeds can be changed by couplings while machine is running. Motor is protected against overload. Replacement parts are carried in stock in the United States.

Importer is:

Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.

What do you do when your v-belts get loose or break?

1 Leave the drive alone

You get more slippage
- ...wasted power
- ...excessive belt wear
- ...uneven sheave wear
- ...less production

2 Slide the motor back

Tight belts get too tight

Life of belts and bearings is reduced

3 Install a new set of belts

Discarded belts mean wasted money

4 Use VEELOS...

Only with VEELOS...

the adjustable v-belt—can you get *all* these operating advantages. And only with Veelos can you eliminate costly v-belt inventory because just four reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

VEELOS DATA BOOK...

The plain facts on construction, installation and use of Veelos are included in this illustrated Data Book —write for your copy.

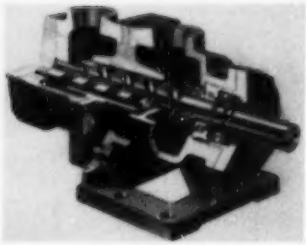
MANHEIM MANUFACTURING & BELTING COMPANY
601 Manbel St., Manheim, Pa.

Link construction permits quick installation
Easy adjustability
... provides controlled tension on each belt
... eliminates loafers
Keeps your machines running for profitable production

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

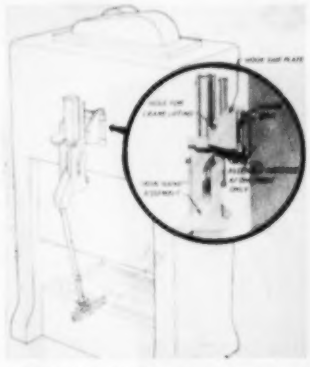


De Laval Rotary Pump Has Only 3 Moving Parts

De Laval-IMO A313B pump saves up to 40% in initial cost over other IMO models for similar pressures. It handles a wide variety of oil-handling applications and pressures up to 275 psi.

It is reported to be quiet, pulsation-free, compact, and to have only three moving parts. It can be used for capacities to 80 gpm, and intermittent pressures up to 325 psi.

De Laval Steam Turbine Co., Trenton 2, N. J.



MOUNTING DEVICE allows Iron Hand press unloaders to be transferred from one press to another in a matter of minutes. The side plates hook onto cross bars of a bracket permanently attached to the top of the press. The mounting is fastened and locked at one point only. Holes in the side plates facilitate lifting and transfer of the unloader by crane. — *Sahlin Engineering Co., Birmingham, Mich.*

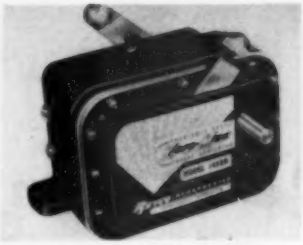
Copper-Clad Sheet Steel In Slabs Up to 3½ In. Thick

These bi-metal sheets combine the corrosion resistance of copper with the strength of steel, and can be deep drawn or otherwise deformed without danger of separation of the constituent metals. The process starts with the thick slabs of steel on which molten copper or copper alloy is cast. The bi-metal slab is then rolled into commercial-sized sheets, plates, and strips. Any percentage of copper or brass to steel can be produced from 10% up.

The two metals are actually fused and alloyed at the meeting point or inter-face. The process was made possible by a highly volatile liquid flux which vaporizes when used. A paste, powder, or liquid flux would leave residues in the casting—forming pockets and inclusions and resulting in unbonded areas. The volatile flux used in the process is called Gasflux.

The process is claimed to be simple and economical since it uses steel in the form of slabs and copper in the form of ingots. It is also said to be adaptable for use in ordinary steel and brass rolling mills — no special, expensive equipment is required. Bi-metal slabs up to 3½ in. thick, carrying approximately 20% copper and 80% steel, have been made and successfully hot rolled into sheet, bar and commercial-sized sheet and strip by several steel companies. Sheets down to 16-gage thickness and 30 in. wide were successfully hot rolled and this metal was then cold-rolled down to 0.005 in. thickness.

Automatic Gas Flux Co., Cleveland, Ohio.

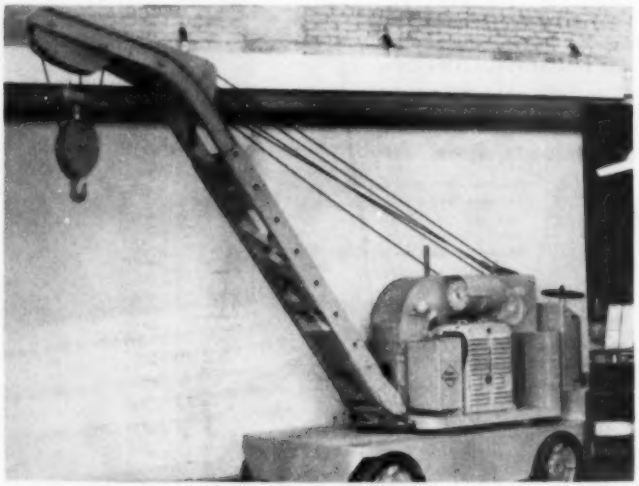


Load Reversed With or Without Load on ¼-Hp Transmission

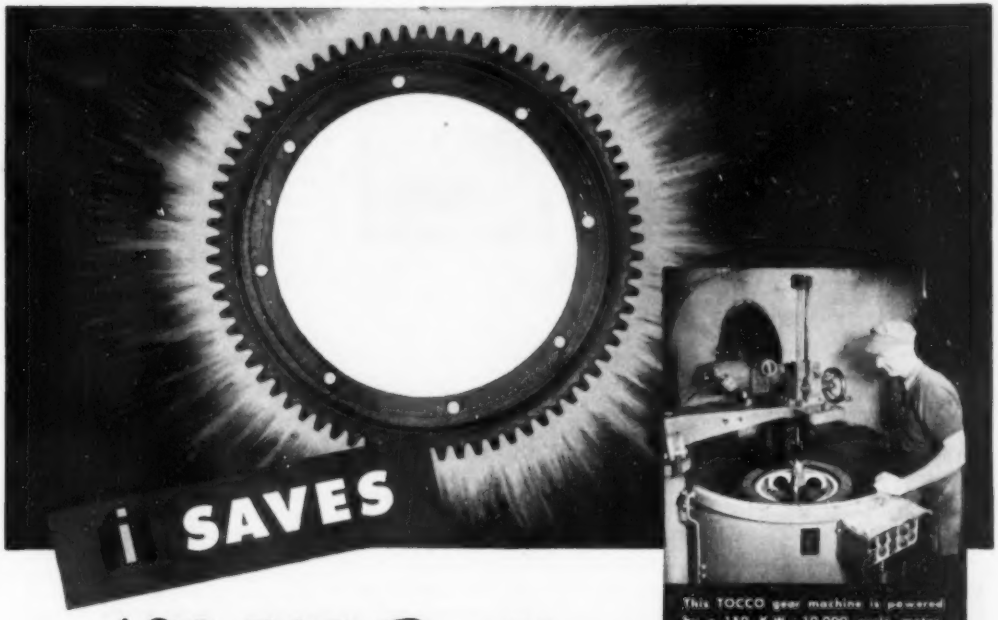
Zero-Max variable-speed torque converter has a range of 0 to ¼ input speed in either direction. The speed and reverse controls are separate levers and the transmission can be reversed at any time, with or without load on the output shaft. The reverse lever moves through neutral and in this position the output shaft is free and can be manually rotated in either direction. The speed control and direction control levers operate in the same plane.

Known as the Model 142XR, it is rated at ¼ hp, at 350 rpm with 1725-rpm motor input speed. Load rating is 20 in. lb. The dimensions excluding shafts are 6x3½x5¼ in. and weight is 6 lb.

Revco Inc., 2 E. Franklin Ave., Minneapolis 4, Minn.



ELECTRIC-POWERED, MOBILE CRANE known as Model CZ has an extra-wide bed and good forward visibility. Design features include: 4-wheel steer; telescoping beam to provide lengths of 12 to 19 ft; heavy, welded-steel frames; and 3 individual motors with solenoid-operated brakes for powering slew, hoist, and boom. Electric power steer can be provided when heavy loads are to be handled. Power is supplied by either an electric storage battery or gas-electric unit. Capacity is 10,000 lb at 5½-ft radius. With boom fully extended to 19 ft, a hook height of 18 ft can be obtained. It will turn in 95-in. intersecting aisles. Maximum slew is 296°. — *The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland*



This TOCCO gear machine is powered by a 150 K.W., 10,000 cycle motor-generator set. Photo—courtesy of International Harvester Company.

$82,507 Per Year with TOCCO* Induction Hardening

GEARS, shafts, pins, wheels, tubes and bars—almost any size or shape of part—or any metal, too—is adaptable to TOCCO hardening, brazing, annealing or heating for forging.

PRODUCTION UP—Engineers at the Milwaukee Works of International Harvester Company have adopted TOCCO for hardening final drive gears for famous International Harvester farm tractors. TOCCO increases production on the gear shown here from 14 to 35 per hour, 250% faster than conventional heating method, reduces job from a 3 shift to 2 shift operation, even with increased production schedule. Heating time is 35 seconds; oil quench, 60 seconds.

COSTS DOWN—TOCCO cuts cost—saves $82,507 per year on application shown above. TOCCO makes possible use of C-1050 A.R.R. steel instead of expensive A-8645-H alloy steel previously required. TOCCO also eliminates shot-blast, formerly needed to remove scale, and extra machining operations that used to be necessary to compensate for distortion.

Gear shown is 18½" O.D., width of face is 2", weight 34 pounds, 73 teeth. Hardness obtained is 55-66 R.C., using 140 K.W. of 10,000 cycle power.

●

Our Engineers can probably find applications in your plant where TOCCO can increase output and reduce unit costs.

THE OHIO CRANKSHAFT COMPANY

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NEW **FREE** BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. B-3, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

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Company _____
Address _____
City _____ Zone ____ State ____

Adjustable Hand Lift Truck For Either Pallets or Skids

These hand trucks have a dual-purpose superstructure that enables them to handle 7- and 12-in. skids as well as single- or double-faced pallets.

When the superstructure is in a raised position, it is clamped vertically to provide a backrest for the pallet load on the truck. When lowered, it is adjustable to either 7- or 12-in. skid heights by a simple cam-and-slot arrangement.

It is available in either mechanical or hydraulic lifts. Platform trucks can be similarly equipped so that they can handle several sizes of skids.

Yale & Towne Mfg. Co., Philadelphia Div., 11,000 Roosevelt Blvd., Philadelphia, Pa.

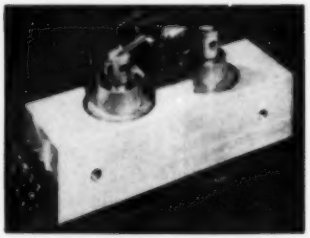
Heliarc Semiautomatic Method Speeds Contour Welding

Contour welds that formerly had to be made with manual apparatus can now be made semi-automatically with the Heliarc HWM-1 welder. Flexibility of manual operation is retained and the advantages of mechanized welding, such as uniformity of speed, arc length, and weld deposit added. Sheet-metal assemblies can be welded at speeds up to 100 ipm.

The semi-automatic torch employs a filler rod which is fed automatically by electrically-powered drive rolls through a flexible conduit into the tungsten arc of the torch. The driven filler rod provides a propelling force which moves the torch when the rod is kept in contact with the work. The operator merely strikes an arc, pulls a trigger to start the filler rod feeding, and accurately steers the moving torch over the line of the weld.

Plain carbon steels and stainless steels in thicknesses from 0.020 to 0.125 in. are said to be welded with excellent results.

Linde Air Products Div., Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.



Scully Oil-Damped 24-P DC Solenoid Unit

Dual-solenoid unit has a full stroke in either direction of $\frac{7}{8}$-in. With a suitable relay circuit, the unit can be electrically centered giving a two-way action.

Intermittent duty pull at $\frac{7}{8}$-in. extended position is $2\frac{1}{2}$ lb; at 1/16 in. from home position it is $5\frac{1}{2}$ lb. Continuous duty pull at $\frac{7}{8}$-in. position is 1 lb, at 1/16 in.—2 lb 3 oz. Cam positions give a wide range of mechanical advantage for motions requiring less than $\frac{7}{8}$-in. stroke. The solenoid can also be supplied in a totally enclosed unit.

Scully Machine Co., 62 Walter St., Bridgeport 8, Conn.

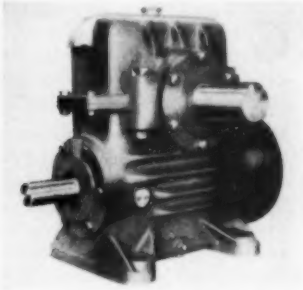
Dark-field microscope is useful in examining micro particles of a refractive index and color similar to the medium in which they exist. The light source is centerable in relation to condenser optics and the condenser can be quickly adjusted for slide thicknesses from 1.15 mm to 1.25 mm. A special 97X oil-immersion objective is supplied with built-in iris diaphragm to eliminate the need for a funnel stop. Either monocular or binocular instruments are available.

Department 000, American Optical Co., Buffalo 15, N. Y.

Rose Safety Chisel Grip

This strap and handle unit avoids bruised fingers when handling a chisel. It is adjustable and made in two sizes to take the vast majority of chisels, punches, marking dies, star drills, etc. The chisel is clamped firmly in a shock-absorbing band so that little or none of the driving impact is transferred to the hand. The metal handpiece allows a full grip. The only adjustment is the large wingnut at the end of the hand grip. Band is of woven fiber.

Rose Mfg. Co., Denver, Colorado.



Fan-Cooled Speed Reducers With Universal Mounting

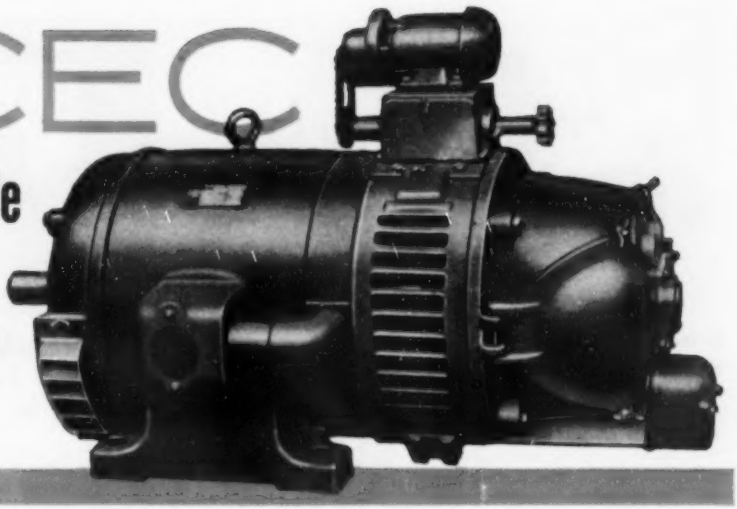
Crofts Radiation speed reducers have ratios ranging from 5 to 1 through 100 to 1 and from fractional up to 400 hp. The smaller worm-reduction units ($1\frac{1}{16}$-, $1\frac{3}{4}$- and $2\frac{1}{4}$-in-dia) feature universal mounting for worm on bottom, top, or vertical installation. Legs are removable and can be mated to other holes in housings to permit varied mounting.

Ten sizes ranging from $3\frac{1}{2}$ to 14 in. are fan-cooled.

National Transmission Distributors, Inc., 68½ Broadway New York, N. Y.

ACEC

Adjustable Speed Induction Motor



Simplifies operation and minimizes maintenance

Here is the ideal low cost solution to the problem of adapting A.C. motors to the job of driving machines which must be operated at variable speeds: The ACEC Schrage-type Adjustable Speed Induction Motor—a rugged, compact, self-contained unit—permits a range of speeds from 0 to 2400 RPM. at the turn of a knob. With the standard type, it is possible to vary the speed from 600 to 1800 (1:3) and from 0 to 2400 RPM.

The motor is designed to work at constant torque and adjustable speeds. At full load, its power factor is always near 1, and thus its use can improve the power factor of a whole plant.

Produced by up-to-the-minute manufacturing techniques which not only assure mechanical precision but minimize production costs, the ACEC "Schrage" affords the most *efficient, simple,* and *economical* means of powering machines that require variable speed drives. It is used extensively in the textile field, and is proving indispensable for numerous applications in the chemical and paper-making industries. Its wide adaptability is evidenced by the fact that it provides the perfect prime mover for such diversified mechanisms as machine tools, variable belt conveyors, automatic stokers, and calenders of different types.

Profit by learning all about the ACEC "Schrage". Write, wire or telephone the nearest ACEC office or representative—or communicate directly with us in New York. We'll be glad to supply you promptly with a complete technical bulletin.

The Schrage-type motor: A rotor winding, similar to that of an induction motor, is connected through slip rings to a 3-phase supply. Brushes, on a commutator connected to a "regulating" winding on the rotor, are connected to electrically separated phases of the stator winding. Changing the position of these brushes, by turning a knob, or by servo-motor with remote control, gives variation in speed.

NOW ON HAND

Integral Horsepower Electric Motors in the following types FULLY GUARANTEED:

- ★ **Adjustable Speed Schrage Motors**
- ★ **Open Drip Proof Motors**
- ★ **Totally Enclosed Fan Cooled Motors**
- ★ **Pump Motors:**
  - Style "C" Face Mounted
  - Style "P" Vertical Solid Shaft
  - Vertical Hollow Shaft

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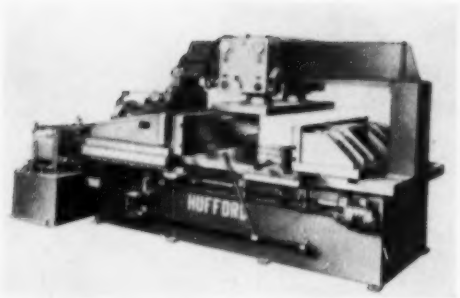


Metal-Forming Bulldozers Use Clamping Cylinders

The Hufford metal-forming bulldozer provides vertical hold-down cylinder replacing the previously used bolts, and positively securing pressure plates on the dies during forming. The cylinders instantly release upon completion of the operation, and allow fast removal of the work and reloading for another cycle.

To effect the vertical clamping, two 25-ton cylinders are mounted on a rolling assembly which may be positioned anywhere along the bulldozer bed. Each cylinder is independently controlled by a four-way selector valve. Pressure may be varied by reducing valves. These controls are integral with the overhead assembly and are mounted on a convenient panel.

For conventional bulldozing when vertical die-pressure cylinders are not required, vertical space is increased simply by unbolting and removing the overhead track and clamping unit.

Sensitive control is provided by a threaded lead-screw shipper rod along the side of the bed. This is rotated by a reversible motor drive. A stop threaded upon this screw may be rapidly shifted back and forth merely by electrical push-button controls. This stop is engaged by the traveling ram, shifting the shipper rod laterally and gradually reducing oil flow from the variable-volume pump. When zero volume is attained, the ram automatically halts.

Fine adjustments may be made by a handwheel attached to the shipper rod. One rotation of the handwheel equals $\frac{1}{8}$ in. of ram travel. The hand level on the machine front controls rate of ram travel start and stop.

Although other work capacities and tonnages are available, the Model-88 bulldozer illustrated is rated at 150-ton. Adjustable platens provide 24 to 60 in. of daylight. Platen dimensions are 16 x 60 in. The overhead clamping unit provides from 8 to 18 in. of daylight and platen measures 24 x 60 in. Pressing speed of main ram is variable, 0 to 70 ipm, retracting 0 to 90 ipm. Main-ram stroke is 24 in.

Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.

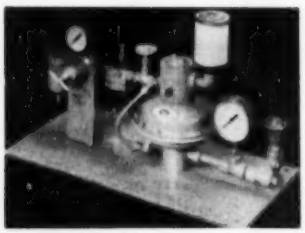
Single-Wing Tangent Bender Uses Automatic Positioning

A single-wing tangent bender from The Cyril Bath Co. will shape flanged sheets around fixed radiused corners without wrinkling. It facilitates rapid, accurate forming of metal cabinets, cases, housings, liners and shrouds having two or four radiused corners. An open-throat design permits easy handling of form shapes. Ram latches with bed the last inch of travel and exerts up to 17-ton vertical pressure.

The tangent bender features automatic positioning of the metal to be formed and close control throughout the entire process. In operation, the metal to be formed is positioned on the bed of the machine which contains the female die. The overhead arm or ram holding the male die moves down upon the material and clamps it into position. The wing swings out and upward to effect positive shaping. At the same time it forms the desired shape. This tangent bender can accomplish any slitting, piercing, stamping or cutting operation within its 17-ton capacity. It can be varied to accommodate radius corners from $\frac{5}{8}$ to 5 in. by merely changing the rack and gear mechanism and the male die.

It is available in three types, having die space of 48, 36, or 24 in. It can be furnished for air or hydraulic operation, and with controls for completely automatic cycling, or with separate ram and wing controls for manual operation. Air-operated machine utilizes standard 70-psi line pressure and requires 2 cu. ft. of air per cycle.

The Cyril Bath Co., 6984 Machinery Ave., Cleveland 3, Ohio



Hydraulic Power Package for Low-Volume Output at High Pressure

This hydraulic power package for oil or water services is broadly applicable for a wide variety of uses where low-volume output at high pressure is the requirement, such as in hydrostatic testing.

The unit is simple to install. Requires only two connections — one to plant air-supply line and the other to manifold, etc., from outlet fluid port of power unit for immediate operation. Contains all necessary equipment, including air-operated pump, air muffler, air filter, air lubricator, air regulator, valves and gages, all mounted on an easy-to-carry Masonite base. The power package measures 12x12x24 in. and weighs 45 lb.

The pump uses either oil or water as the testing medium, and operates automatically on the principle of differential areas. It is furnished in six standard models with ratios of from 35:1, 60:1, 100:1, 150:1, 200:1, 300:1, making possible an output range from 3500 to 30,000 psi.

Sprague Engineering & Sales Corp., Gardena, Calif.

Bearing blue, used for spotting, scraping, and fitting machine parts, is put up in handy 4-oz. cans. It is so compounded that it will not dry.

Dayton Rogers Mfg. Co., Minneapolis 7, Minn.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

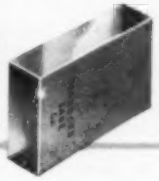
During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

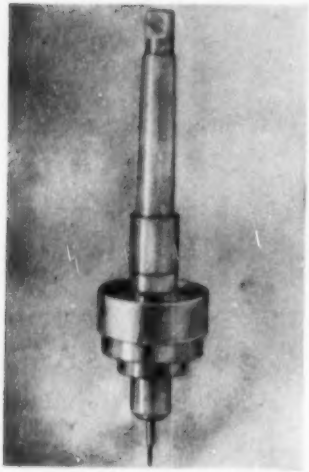
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks





Sensitive Tapping Head Taps Up to 4-40 Holes at High Speed

This tapping head has been designed expressly for tapping 0-80 to 4-40 holes in steel or other material at high speed and with sensitive feel of the tapping operation. In operation, the tapping head is mounted to the spindle of a standard drillpress. A provision for vertical travel of the tap is built into the tapping head itself, neither the control lever on the drillpress or vertical travel of the drillpress spindle is utilized.

Control of tapping operation is through the knurled collar just above the tap. This control collar is held lightly in hand by the operator. A light downward pressure applied to the collar drives the tap into the work and a light upward pressure reverses it. During the tapping operation, the tap can be cleared if necessary by rapid reverse control.

When tapping 0-80 or 1-72 holes, a special factory-adjusted clutch prevents overloading the tap. For larger holes to 4-40, no special protection is required and this clutch is locked.

Winslow Product Engineering Corp., 5420 Jillson St., Los Angels 22, Calif.

Photocopying method is based on a new principle of instant and automatically developing and fixing. It is said to enable anyone without training or special skill to produce clear black-and-white photo-exact copies of any original in any office. The method uses only two simple steps instead of 12 required by conventional photocopy equipment. A finished copy is made in less than 30 sec. The machine used is compact, occupying no more space than a typewriter and can operate on a desk top. Requires no darkroom, special running-water setup, exhaust pipes and creates no ammonia fumes. The method operates on a transfer - facsimile principle and employs two different types of paper, a No. 1 sheet sensitive to light and a No. 2 sheet not sensitive to light. Both papers are coated with special emulsion. The unit is designed to handle letter and legal-size copies as well as larger copies up to 11x17 in.

American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, Ill.

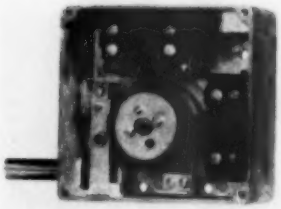
Stand-Up Drive Tractor For Warehouse Handling

The stand-up drive Load-Mobile tractor has been designed for use in warehouses where items are stored on either skids or pallets, one skid or pallet for each item. The operator starts on the circuit, and as he goes through the aisles, he piles on the trailer the specified orders. When the circuit is completed, he hauls the entire load to the shipping room where it is shipped out. Designed with a low platform seven inches off the floor, it eliminates unnecessary exertion in getting on and off or to unload.

It uses the same pedal for both forward and reverse operations. Reversing is controlled by a separate selector switch. It hauls up to 10,000 lb of load at approximately 3 mph. No-load speed is 4½ mph.

A power-unit drive mechanism is attached to the special low platform using a 340-amp-hr battery. Drive wheel is 10½ in. in diameter and has a 7-in. face. Rear wheels are 7 in. in diameter and 5-in. face. All wheels are fitted with two sealed ball-bearings in each wheel.

Market Forge Co., Everett 49, Mass.



GE Limit Switch for Reversing Operation in Driven Equipment

A rotating limit switch for application where reversing operation is to be co-ordinated with the number of revolutions of a motor shaft or drive equipment can be used to control motor-operated doors and windows, valves on machine tools, baling operations, travel limits on machinery, etc.

The switch consists of two size 2 Switchettes having one normally open and one normally closed circuit. Switch units are operated independently by cams rotated through a worm and gear reduction from a shaft extending outside the case.

Simple adjustment of the limit switch is accomplished by loosening two clamping screws, turning slotted adjusting pins, one for each cam in the desired setting and then retightening the clamping screws. It can be adjusted to operate from four to 110 turns of the driving shaft with 5 turns overtravel in either direction. Unlimited overtravel is possible without damage to the switch.

All parts are readily accessible for easy installation, adjustment and maintenance. The standard form of the switch is housed in a zinc die-cast case with removable cover and measures approximately 4 in. sq. and 2 in. deep. Also available are watertight and explosion-proof forms in cast-iron cases.

General Electric Co., Schenectady 5, N. Y.

An electric soldering iron for use on fast production lines where greater speed is required from an iron with a small tip diameter. This iron is the plug-tip type rated at 150 watts with a ¼-in.-dia tip which reaches a soldering temperature considerably beyond that of conventional soldering irons. The element construction has been designed to withstand the unusually high temperature developed. Elements and tips are replaceable. List price, $8.50.

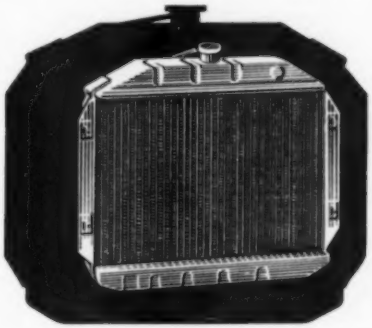
Hexacon Electric Co., 135 W. Clay Ave., Roselle Park, N. J.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

Substitution of materials is of considerable concern to many manufacturers these days. Never before have we seen so much interest in the subject. However, it is by no means new to Revere, which has always held to the principle of recommending the metal that will best serve the customer. Thus, we have often suggested switching from one metal or alloy to another, with the object of lowering costs, increasing production, improving service, or all three.

When based on a detailed study of all the factors involved, substitution at times can be extremely valuable. In fact, the ever-increasing quality and service to be found in American products is due in part to the continued search for better materials, and their adoption when found. Better materials, better design, finer workmanship—these are part of American progress.



But there are instances, of course, when no practical substitute can be found, when only one material offers just the right combination of good qualities required for a given application. Take the automobile radiator. This has always been made of copper, because copper is the one and thus far only metal that perfectly meets all the requirements of manufacture and service. To make a radiator, very thin copper sheet and strip must be crimped, bent and otherwise formed. Copper's easy workability makes it ideal from the manufacturing standpoint. After assembly, the radiator is cleaned, and made water-tight by dipping in a bath of hot solder. Copper is exceptionally easy to solder. When in service on a car, truck or bus, the radiator must not rust, and must resist corrosion by water and anti-freeze. Copper is notable for its resistance to corrosion in such use. The radiator must also cool the water by radiating its heat into the air stream; copper has the highest heat conductivity of all commercial metals. A copper radiator thus is the most efficient and durable. It should outlast the car unless accidentally damaged, and when the injury is not so great as to make replacement necessary, the nearest shop can make repairs easily.

Recently it has been suggested that automotive radiators should be made of aluminum. However, both copper and aluminum are temporarily in short supply, and therefore to substitute one for the other does not appear to be practical. Beyond that, we do not believe —based upon experience to date—that aluminum's qualities, fine though they are, necessarily make it suitable for automotive radiators. In addition, the difficulties of retooling in the factory and repairs in the field must be considered. Revere fabricates both copper and aluminum, and we have reason to believe that our impartial advice to stay with copper for automotive radiators is concurred in by radiator manufacturers.

When you are tempted to substitute one material for another in your product, no matter what it may be, make certain you obtain all the facts as to costs, production, service. Your suppliers will be glad to collaborate with you in studying the effects of a proposed change. We suggest you take full advantage of their knowledge and experience.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: **230 Park Avenue, New York 17, N.Y.**

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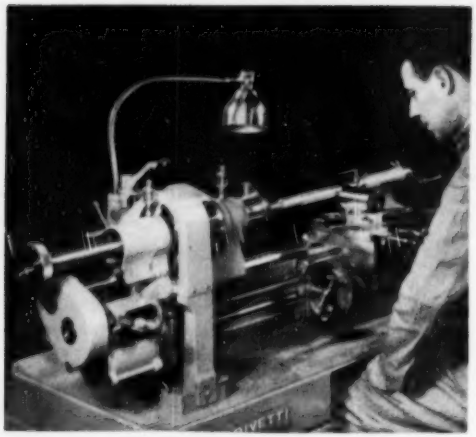


Instrument Lathe Will Turn Or Bore Within 0.0001 in.

This 8½-in. swing instrument lathe is guaranteed to turn a bore within 0.0001 in. in six inches. Work is held in collet or between centers.

A back-geared, screw-cutting engine lathe, Model 608, it is recommended for a variety of work. Attachments are available for milling, spiral cutting, slotting, relieving, taper turning, radius turning, grinding and forming, permitting the user to complete an entire series of metal operations.

It has ample slide areas equalling those of other lathes twice its size. Its bronze-bearing spindle is capable of extreme turning accuracy and finish.

Performance within the guaranteed limits is attained and safeguarded by a three-point bed mounting; a double-bevel alignment for head and tailstock; a carriage bearing of 76 sq in. on the bedways; separate leadscrew for thread cutting; double-taper, self-aligning spindle bearings, and a heat-treated feedscrew.

Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.

Monochromatic Light from DoAll Measures with Light Waves

Called Monolight, the monochromatic light is a self-contained unit in a light rigid-cast aluminum body having a 5x5½-in. high-intensity helium-tube light source providing 53-ft candle power on the testing stage. Standard stage is a 6⅛ in. x 4⅛-in. phenolic plate which can, at additional cost, be substituted by a granite surface plate lapped to within one wave band of true flatness. Storage space is provided to house extension cord and the optical flats.

Power supply is a 7500-volt transformer operating on 110-120 volt, 60-cycle ac line.

The helium-tube light source provides extremely accurate interference bands at 0.0000116-in. intervals, and when used with acurate optical flats can be used to measure size, flatness and parallelism to within a few millionths of an inch. To inspect large areas or greater work heights, the head or light source may be turned 180° giving the operator a large working area.

Available accessories include a complete range of gage blocks and optical flats. The flats are made in tolerances to suit any inspection work and standard sizes are stocked in both round and square shapes, and may be had with one or two optically flat surfaces.

Size of the unit is 9½x11¾x16 in. high, weight is 30 lb.

DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.

FORK-LIFT TRUCKS, either diesel or gasoline powered, are available in 12 models on solid or cushion tires in capacities of 3000-, 4000-, 5000-, 6000-, and 7500-lb at 24-in. load center and 4000-lb capacity at 18-in. load center. Special feature of these fork trucks include all-roller-construction mast with special rolled mast channels; two speeds forward and two speeds reverse single-lever gear shift; quick - change, heavy - duty clutch; complete complement of electrical gages on full front-vision instrument panel; carriage mounted on adjustable side thrust rollers to reduce wear; complete accessibility of all parts for maintenance and servicing, and standardization and interchangeability of parts between 12 models.—*The Buda Co., Harvey, Ill.*

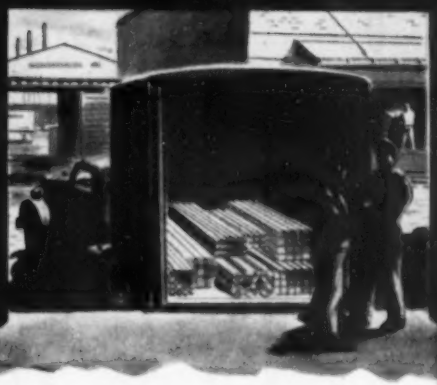
A cold solder, made of fine metallic aluminum and a quick-drying non-soluble vehicle is being made in a more jellied state. This means easier application and more area covered per unit volume. The material can be applied with a putty knife, or thinned down to a brushing or spraying consistency. A thinner is applied by the manufacturer for this purpose. A typical use is for filling pits, blow holes, or fractures in castings.

A. L. Okun, Distributor, 148-26 — 5th Ave., Flushing 55, New York, N. Y.

Wet-blasting abrasives range from 80 to 2500 mesh and are packed in 50-lb weights for easy charging. The company will also provide from stock all of the other chemicals needed for wet blasting. Anarust, a rust inhibitor, and Anaset, an anti-packing chemical are two of them.

American Wheelabrator & Equipment Corp., Mishawaka, Ind.

for better die production...



"DESEGATIZED" hi carbon-hi chromium DIE STEELS

provide a selection range designed to fit your individual need for die steels:

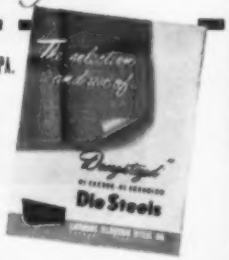
- Select B—a general purpose air hardening punch and die steel
- Olympic—a very popular non-deforming steel, ideal for intricate cold work applications requiring maximum performance
- Cobalt Chrome—a high carbon—high chromium steel plus cobalt for superior cutting ability
- GSN—an oil hardening die steel for long production runs, subject to severe wear
- BR-4—a high carbon—high chromium die steel with additional alloy content for maximum abrasion resistance.

Production economy demands the best die performance! Select the best steel for the job—one of the "DESEGATIZED" Hi Carbon—Hi Chromium Die Steels!

Clip coupon-mail today

LATROBE ELECTRIC STEEL CO., LATROBE, PA.

Yes! Please send me the booklet, "Selection and Use of Latrobe's "DESEGATIZED" Hi Carbon—High Chromium Die Steels".



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STREET _____

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LATROBE ELECTRIC STEEL COMPANY

LATROBE, PA.

Branch Offices and Warehouses: BOSTON, BUFFALO, CHICAGO, CLEVELAND, DAYTON, DETROIT, HARTFORD, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, TOLEDO

Sales Agents: DALLAS, DENVER, HOUSTON, MINNEAPOLIS, SEATTLE, WICHITA

Some "fitting" remarks for the grinding department

SIMONDS ABRASIVE CO.

Grinding Wheels

Proper fit for the grind! Properly fitted to the grinder! That's the story on Simonds Abrasive Company grinding wheels . . . right in grain and grade combinations for every grinding job . . . accurately specified production tools in a complete line including grinding wheels of all shapes and sizes, mounted wheels and points, segments and abrasive grain . . . consistent dependable products backed by Simonds Abrasive Company's 60 years experience as a major grinding wheel manufacturer. Let's send you free data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO. PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Names in the News

. . . continued from page 173

William G. Thannert has been named factory manager of Trackson Co., Milwaukee, wholly-owned subsidiary of Caterpillar Tractor Co., Peoria, Ill. Mr. Thannert was previously general planning superintendent at Caterpillar. He joined the firm in 1936 as apprentice machinist.

Robert P. Williams Jr. and **Clarence Graham Sr.** have been elected vice presidents of Rheem Mfg. Co. Mr. Williams, Washington manager, joined the firm in 1942, and is a vice president of American Ordnance Association. Mr. Graham was president of James Graham Mfg. Co., Newark, Calif., manufacturer of Wedgewood gas ranges. Rheem purchased the company last year, and is operating it as the Wedgewood Div.

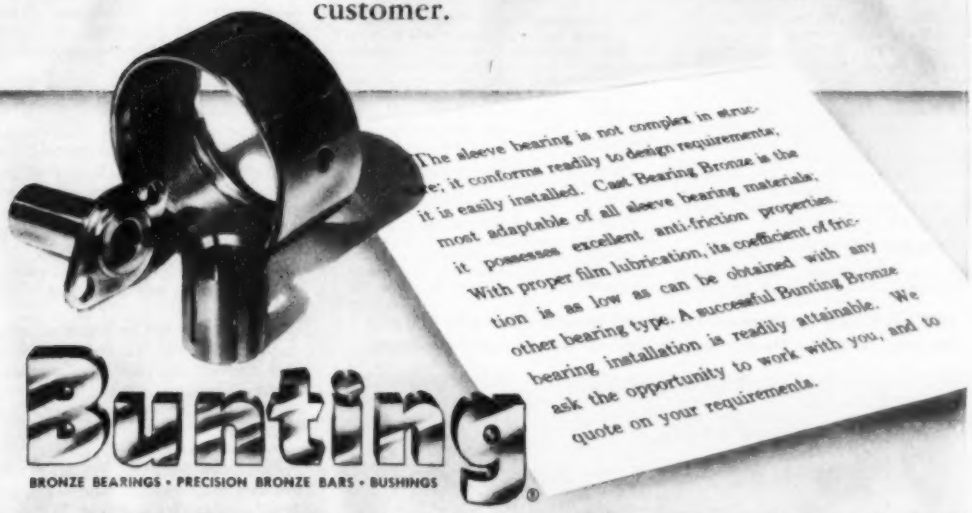
J. A. Cuneo, former manager of the Chicago branch of Fairbanks, Morse & Co., Chicago, has been named general sales manager. **Gordon R. Anderson** and **George C. Worthley** have been named managers of the Electrical and Scale Divisions, respectively, following the recent announcement of autonomous operation for the two divisions. Mr. Anderson was manager of the Freeport Works. Mr. Worthley was manager of the Scale Div. **W. H. Kingsley** is sales manager of the Electrical Div. **Joe Peterson** was named sales manager, Scale Div. Other changes: **Milo C. Roy** named Chicago manager; **J. W. Wright,** Omaha manager; **C. E. Dietle,** manager, Diesel Sales Div.; **W. B. Wylly,** manager, Atlanta branch; **L. A. Weom,** St. Paul branch manager, succeeding **A. C. Thompson,** retired; **Clifford J. Schroeder,** St. Louis branch manager.

W. E. Brainard has been elected president and director of Arcrods Corp., New York, replacing **J. H. Humberstone** who was named chairman. Mr. Brainard joined Arcrods in 1939 as superintendent of the Cleveland plant. He was elected vice president in 1948.

John Lund has been named district manager of Air Reduction Magnolia Co., a division of Air Reduction Co., Inc., New York. With headquarters at Shreveport, La., he will have sales responsibility for that district, succeeding the late **Heber T. Wadley.** Mr. Lund had been assistant to Mr. Wadley.

"customer conscious..."

You are treated like a customer when you deal with The Bunting Brass & Bronze Company. It is a tradition in the Bunting organization to consider the good will of the customer as the most important factor in the transaction. Bunting customers find that Bunting resourcefulness no less than Bunting products, is made available when needed . . . Ask any Bunting customer.


The sleeve bearing is not complex in struc-
re; it conforms readily to design requirements,
it is easily installed. Cast Bearing Bronze is the
most adaptable of all sleeve bearing materials,
it possesses excellent anti-friction properties.
With proper film lubrication, its coefficient of fric-
tion is as low as can be obtained with any
other bearing type. A successful Bunting Bronze
bearing installation is readily attainable. We
ask the opportunity to work with you, and to
quote on your requirements.

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ALBION MALLEABLE IRON CO.
cuts cold-shearing costs with

FARQUHAR Hydraulic Press

The Albion Malleable Iron Company produces automotive castings at its Albion, Michigan plant. Cold-shearing the gates from the castings in this modern plant requires dependable, trouble-free equipment, and for this equipment Albion turned to Farquhar engineers. After studying the problem, Farquhar recommended a 200-ton self-aligned, gap-type Farquhar Hydraulic Press. This press not only proved completely satisfactory in operation, but was also able to effect substantial economies because it was designed *specifically* for the job in hand.

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production. Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Give them a call.

Send for Free Catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: A. B. FARQUHAR CO., *Hydraulic Press Division*, 1506 Duke St., York, Pa.

GET THE DETAILS on how our Deferred Payment Plan helps you pay for your Farquhar Hydraulic Press out of the savings it produces!

Willard J. Sullivan

Willard J. Sullivan has been named sales manager of Boyar-Schultz Corp., Chicago, succeeding Walter H. Brooke who resigned to enter his own business. He will operate under the name of Walter H. Brooke Machine Tools, at 5740 West Chicago Ave., Chicago 51. Mr. Sullivan had previously operated his own business in Providence, R. I.

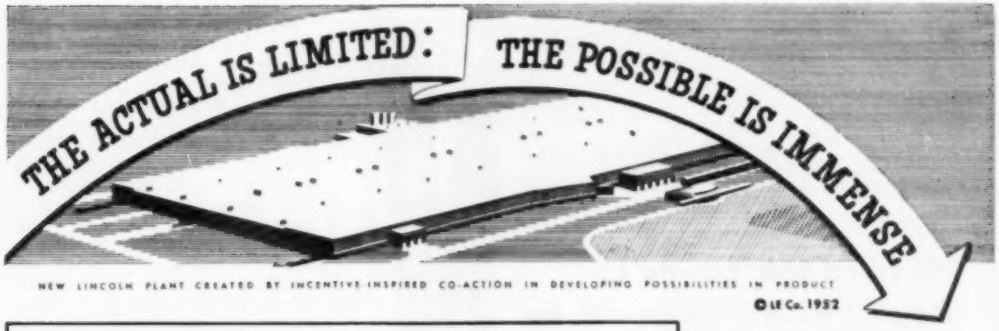
J. A. Sizer has been elected president of Industrial Gear Mfg. Co., Chicago. He was vice president and sales director. Mr. Sizer succeeds **A. M. Scharek**, founder of the firm, who was elected chairman and chief executive officer.

H. H. Doehler has resigned as chairman of Doehler-Jarvis Corp., New York, being succeeded by **L. A. Jarvis**, president. **F. J. Koegler**, executive vice president, was elected president. Mr. Doehler was named to the new office of honorary chairman, duties of which include chairmanship of the executive committee.

William H. Taylor, formerly director of engineering and assistant to the vice president of Tinnerman Products, Inc., has been named general sales manager. He joined the firm in 1945 as a salesman, later became sales manager of the Detroit office. Prior to joining Tinnerman, he had been with Budd Mfg. Co., Packard Motor Car Co., Douglas Aircraft Corp., and Ford Motor Co.

F. C. Berger has been named sales manager of Neff Kohlbusch & Bissell, Chicago, machine tool distributors. Company offices have been moved to 5700 W. North Ave., Chicago 39.

Robert M. McCabe, affiliated with Vickers Inc., Detroit, since 1934 has been elected vice president in charge of purchasing.



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT . . . cuts costs for Hanson-Van Winkle-Munning

THE examples show how one prominent manufacturer has improved the quality of his products while cutting costs by converting to welded steel design.

When designing for efficient welded steel construction, savings in initial material cost alone generally average 85% to 95%. This is because steel costs less per pound. And with steel's greater strength and rigidity, fewer pounds of metal are needed. In many cases, machining operations required for iron can be minimized or eliminated entirely.

Where product designs utilize the economies of welded steel, cost analyses show that:

1. Material costs for steel generally range from 5% to 15% as compared with castings.

2. Labor costs for fabricating steel are about 30% of initial casting purchase costs.

3. Welding costs average 50% of total labor costs for fabricating steel.

If your costs do not approximate these averages, your product designs should be reappraised. A Lincoln Welding Engineer will gladly point out what benefits of welded steel may have been overlooked.

Inquire about the "Weldesign Training Course" for your engineers, designers and production men.

Fig. 3. Welded steel *saves 30% cost . . . can weight 50%. Design is simpler . . . plain channel replaces complicated casting.*

Fig. 4. Stronger, more rugged machine part *results when fabricated from steel strip and standard channel. Weight is cut from 3 lbs. to 2 lbs. 4 oz. Cost of this small part is 15% less.*

ORIGINAL CONSTRUCTION

Fig. 1. Machine bracket *for* **Hanson-Van Winkle-Munning,** *Matawan, N.J. weighed 50% more than present steel design. Casting had to be left heavy for strength in hub and arm. Design made efficient use of cast iron by providing cored slots. Casting required milling and drilling.*

PRESENT WELDED STEEL DESIGN

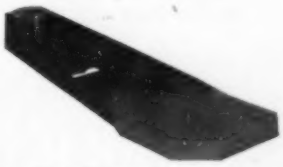


Fig. 2. Finished weldment *costs 25% less . . . eliminates former breakage experienced in casting. Steel hub, cut from bar stock and pre-drilled, is welded to simple formed steel arm in which holes are pre-punched.*

MORE SAVINGS

Machine Design Sheets are available to designers and engineers. Write on your letterhead to Dept. 103.

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

The World's Largest Manufacturer of Arc Welding Equipment.

We asked 488 'Experts' to compare MICROTOMICs with the drawing pencils they were using..
94% VOTED
MICROTOMIC
MORE UNIFORM!
Our 'experts' were engineers, architects, draftsmen, purchasing agents—drawing pencil buyers and users like yourself.
The test they made was to compare the uniformity of 3 MICROTOMIC pencils of the same degree, with that of 3 same-degree pencils they were then using.
459 of them—an amazing 94% of those who made the test—picked the New MICROTOMIC Drawing Pencil as "more uniform"!
What's more, 384 of these 'experts' within a month said they either were 'already using MICROTOMICs', or intended to specify MICROTOMICs on their next pencil order!
EBERHARD FABER
free! Try the 3 against 3 test yourself
MAIL FOR FREE TEST PENCILS!
EBERHARD FABER PENCIL CO., Dept. AM-3
37 Greenpoint Avenue, Brooklyn 22, N.Y.
I'd like to test the uniformity of 3 ..... degree MICROTOMICs vs. my present drawing pencils.
NAME
FIRM
STREET
CITY
EBERHARD FABER
2H
MICROTOMIC
USA

Dr. Newman W. Thibault has been named chief of a newly formed physical research section, Research & Development Dept., Norton Co., Worcester, Mass. **Richard E. Englund** was named grinding service engineer in charge of a new grinding service section. Dr. Thibault will direct all physical research, and Mr. Englund all grinding tests and other services previously under the head of **H. Walter Wagner,** a leading authority on many phases of grinding and wheel performance, who retired after 33 years with Norton. Mr. Wagner was head of the mechanical section of the department. **J. Richard Leonard** has been named sales representative of the Grinding Machine Div., covering Maine, New Hampshire, Vermont, Rhode Island and eastern and central Massachusetts, with headquarters in Worcester. He succeeds **Louis J. Camarra,** who has been assigned duties with Norton Behr-Manning Overseas, Inc.

Charles W. Lee has been named vice president of production of the Consolidated Western Steel Div., United States Steel Co., succeeding **Lloyd Earl,** resigned. His headquarters will be at the Maywood, Calif., plant.

John J. Fitzsimmons has been named to the sales engineering staff of Illinois Tool Works, Chicago, to serve cutting tool users in the Detroit area. Before joining Illinois Tool he was with Continental Tool Div., of Ex-Cell-O Corp. and Ford Motor Co. as a tool design engineer.

Thomas J. Moore, Jr., has been named general manager, Brainard Steel Div., Warren, Ohio. He was vice president of Brainard before the recent designation of Sharon Steel's subsidiaries as operating divisions. **E. T. Sprouil,** formerly president of Brainard, will serve as chairman of the management committee. **William J. Keegan,** formerly secretary and treasurer, is now assistant general manager.

C. W. Palmer has been named manager, Toledo plant products, National Supply Co. He will be responsible for direction of the planning, scheduling and purchasing departments at the Toledo plant, as well as being responsible for commercial customer contacts. He joined the firm as manager of procurement for the Toledo Div. in 1943.

Melvin W. Pauly has been named eastern division sales manager, **Harold H. Layritz** was named central

THE NEW *CLAUSING*

HEAVY DUTY

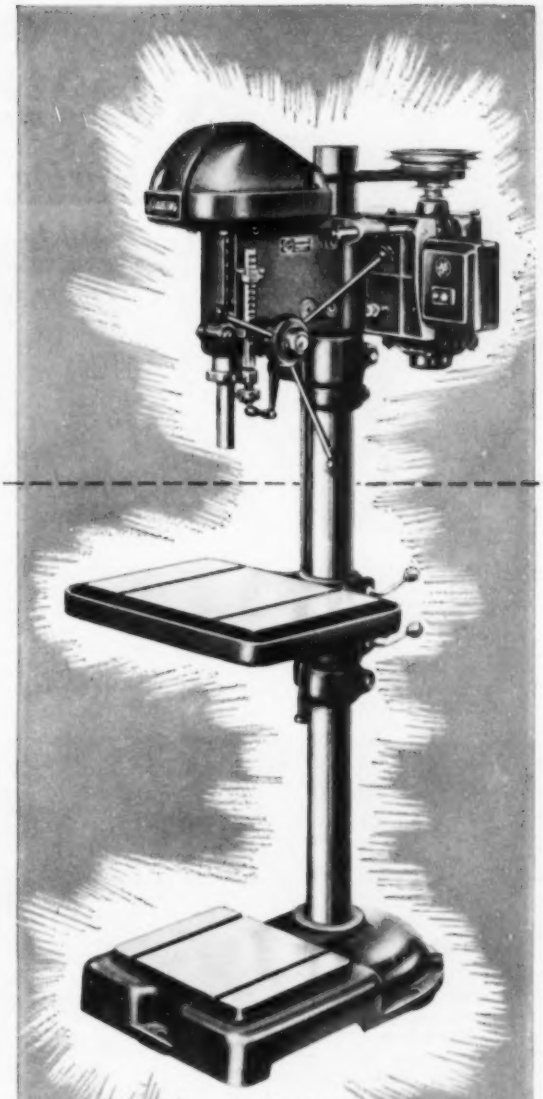
18" DRILL PRESS

A HEAVY DUTY GENERAL PURPOSE DRILL FOR PRODUCTION, TOOL ROOM, MAINTENANCE, AND SERVICE SHOPS

Atlas CLAUSING
PRECISION MACHINE TOOLS
ATLAS PRESS COMPANY

Outstanding features include: massive construction and precision machining to assure an extra measure of fine performance; drive spindle supported by sealed-for-life ball bearings above and below pulley; sealed-for-life ball bearing at top and double row sealed ball bearing at bottom float spindle free from quill; both races in double row bearing absorb drill thrust; Vernier depth control stop; greater spindle travel for bigger work capacity and better use of quick-release production chucks; positioning mechanism moves *both* head and table; hinged motor support base; precision ground base. Catalog sent on request.

★ Drills to Center of 18¼" Circle ★ Drills ¾" in Steel, 1" in Cast Iron ★ 6½" Spindle Travel ★ 4¾" Spindle, Equipped with No. 3 Morse Taper ★ 39" Maximum Distance Spindle to Table, 50" Spindle to Base ★ 13" x 18" Production Oil Table or 12" x 14" Tilting Table ★ 4 Ball Bearings — 3 Single Race, 1 Double Race.



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CLAUSING DIVISION

ATLAS PRESS COMPANY

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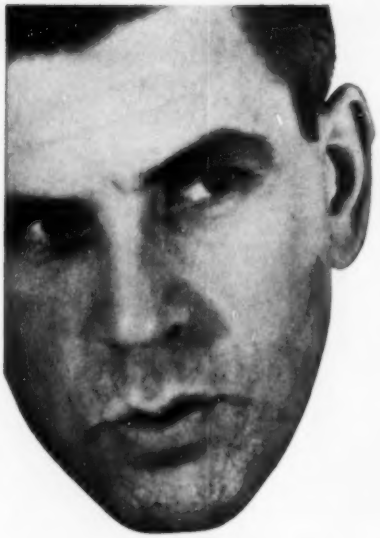


how much is bearing trouble affecting your products' reputation?

It can you know — and yet it is so easy to avoid machinery inefficiencies traceable to bearing failures. Just be sure to specify one of the MULTIROL full type roller bearing series. Each is designed for a specific kind of service and has proven ability to carry greater loads longer with more precision and less maintenance. Their dependability will help keep your machinery at its peak. Select one of the following types and write today for more details in the new McGill Bearing Catalog No. 52.

division sales manager, and **Charles W. Burrage**, western division sales manager of The Lunkenheimer Co., Cincinnati, under a general reorganization of sales territories. District managers named for the three divisions are: **R. J. Sardieck**, eastern, at Philadelphia; **E. R. Tieberman**, central, at Dallas, and **C. B. Rosser, Jr.**, western, at Los Angeles.

F. S. Elfred has been named executive vice president of Olin Industries, Inc., New York. **B. E. Bassett** was named vice president for production, and **M. W. Acker** was named a vice president. Mr. Elfred will have responsibility for operation of five new integrated operating divisions: metals, explosives, arms and ammunition, electrical, and export.

Harold Brilmyer has been named assistant to the president of Huck Mfg. Co., Detroit. He was formerly with Glen L. Martin Co. as senior stress analyst in the structural research and development group.

W. W. Kovalick has been named production manager of the Chicago plant, Ingersoll Products Div., Borg-Warner Corp., succeeding **J. W. Dean**, resigned. Mr. Kovalick was chief engineer. **H. T. Burke**, formerly chief tool engineer, was named acting chief engineer.

Lawrence C. Jones has been elected president of Van Dorn Iron Works Co., Cleveland, succeeding his father, **Norton T. Jones**, who died Dec. 18. He joined Van Dorn 14 years ago, was elected vice president two years ago. He also has been general manager of Davies Can Co. and Colonial Plastics Mfg. Co., subsidiary companies.

E. H. Higginbotham has joined the southwest division of Warner Electric Brake & Clutch Co., Beloit, Wis., as district representative, with headquarters in Oklahoma City.

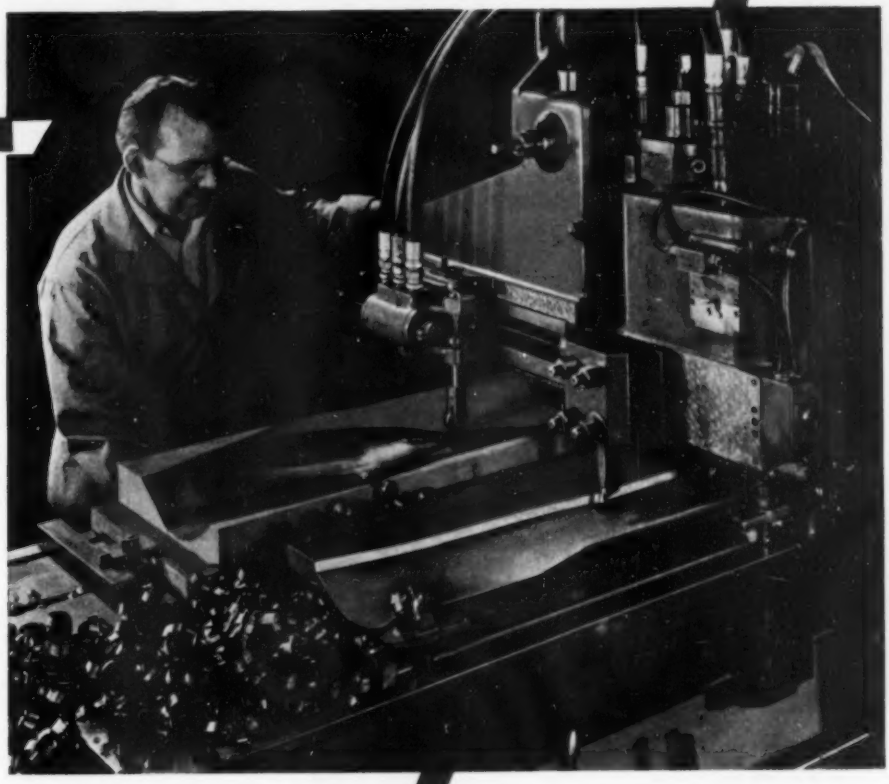
E. A. Schwartz has been named assistant vice president in charge of steel operations for Republic Steel Corp., Cleveland. He succeeds **M. E. Goetz**, named manager of Republic's Cleveland district, the position formerly held by Mr. Schwartz.

Dave Wallace has been named assistant sales manager of Cincinnati Lathe & Tool Co., Cincinnati. Previously he represented the firm in the central states with headquarters in Chicago. In his new position he will operate out of the company's main office in Cincinnati.

KOPY-KAT
ROCKFORD MACHINE TOOL CO.

DUPLICATES *Complex forms*

with ease of straight-production machining



. . . on hydraulic shapers, planers and slotters

DIRECT TRANSFER — NO INTERMEDIATE MOTIONS

The Kopy-Kat is so sensitive, so exact, that positive duplication of complex forms is done with the ease of straight-production machining. Contours or full forms are produced, using inexpensive masters mounted on the cross-rail or table. A stylus transfers the form *directly* to the tool head through the patented hydraulic duplicator valve. Inaccuracies are eliminated by the absence of intermediate motions.

FAST WORK — LESS COST With the new Kopy-Kat you can turn out odd-shaped parts rapidly and economically for implements, aircraft, jet, turbine and other defense assemblies. Much time and money are saved with inexpensive masters, or by using the orignal form itself. Tooling and fixtures are greatly simplified.

Ask a Rockford Hydraulic representative to show you how the Kopy-Kat can simplify your form-machining problems. He can give you the complete story, with examples on many irregular mathematical curves and shapes.

For a quick picture send for Data Sheets No. 12.

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Hy-Draulic

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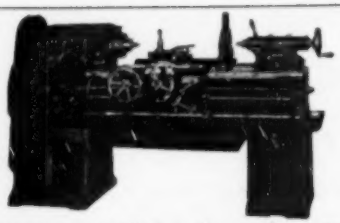


BRADFORD *Metalmaster* LATHE

features . . .

1. Oil Gages.
2. Push Button Station.
3. Three Speed-Change Levers.
4. Large Dials.
5. Offset Compound Rest.
6. Heavy Tailstock Clamp Bolts.
7. Ball Thrust Bearing.
8. Adjustable Feed Stop—Either Direction.
9. Starter in Leg.
10. Leveling Screws.
11. Sixty-four Feeds and Threads.

Precision Since 1840

The BRADFORD MACHINE TOOL CO.

CINCINNATI, OHIO

10 Good Reasons

why YOU should use NATIONAL Keyseating Millers on your next job

They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

national MACHINE TOOL CO.

CINCINNATI 22, OHIO

WRITE TODAY

For Catalog No 17 complete, handy size

Thomas Sproule

Thomas Sproule has been named manager of manufacturing of the General Electric Company's Welding Dept. in Fitchburg, Mass., succeeding **William G. Arnold** who was named works manager of the GE plant at New Kensington, Pa. Mr. Sproule was assistant manager of manufacturing of GE's Turbine & Welding Divisions in Fitchburg.

David Campbell has been named general manager of the new Chatham, Ontario plant of Progressive Welder (Canada) Ltd. Before joining the Progressive organization in Detroit in 1940 he was a foreman at the U.S. Naval Ordnance Plant, Detroit. He was most recently assistant sales manager in the Progressive home office.

J. Edward Olson, former chief plant layout engineer of the Saco-Lowell Shops, Biddeford, Me., has resigned that post and has joined Raytor Corp., Lansdale, Pa., as production manager. Raytor has moved its operations to new quarters in Lansdale, Pa., at 5th St. and Cannon Ave.

John W. Slavik has returned to American Welding & Mfg. Co., Warren, Ohio, as manager of machined products development, a position newly created upon purchase by American Welding of Warren Machine & Die Co., which Mr. Slavik established in 1946. During World War II Mr. Slavik was general foreman of American Welding & Mfg Co's boring mill dept.

Tom Turner and **T. I. Phillips,** vice presidents, have been reassigned by Westinghouse Electric Corp., Pittsburgh, to new positions. Mr. Phillips, who headed the East Pittsburgh divisions becomes staff vice president in charge of manufacturing, succeeding Mr. Turner who was named vice president in charge of the Motor and Control Div. at Buffalo, N.Y. Mr.

ALLOY STEEL UNNECESSARY!

COSTS CUT IN HALF
Excellent
WEAR RESISTANCE
Obtained...
with GROUND and POLISHED
STRESSPROOF
STEEL BARS
In this Kearney & Trecker new Model CK vertical milling machine, the 2" diameter feed screw (right) is made from Ground and Polished STRESSPROOF

THREE OPERATIONS ELIMINATED

- QUENCHING
- TEMPERING
- STRAIGHTENING

Ground and Polished STRESSPROOF has been used for lead and feed screws by Kearney & Trecker since 1939. If STRESSPROOF were not available, they would need a .50% carbon-alloy steel to obtain the required strength and wear-resistant properties. The substitution of alloy would require quenching, tempering and straightening—operations not necessary with Ground and Polished STRESSPROOF. The cost of the part would be more than doubled.

For precision work, lead and feed screws for machine tools must maintain their accuracy through years of operation. Ground and Polished STRESSPROOF cuts cost for these exacting parts because it provides *five* qualities in the bar—(1) *high strength*, double that of ordinary cold-finished shafting; (2) *machinability*, fully 50% better than heat-treated alloys of the same hardness; (3) *high resistance to wear*, replacing many heat-treated or carburized alloys; (4) *minimum warpage*, obtained by special processing; and (5) *accurate, finely ground surface*.

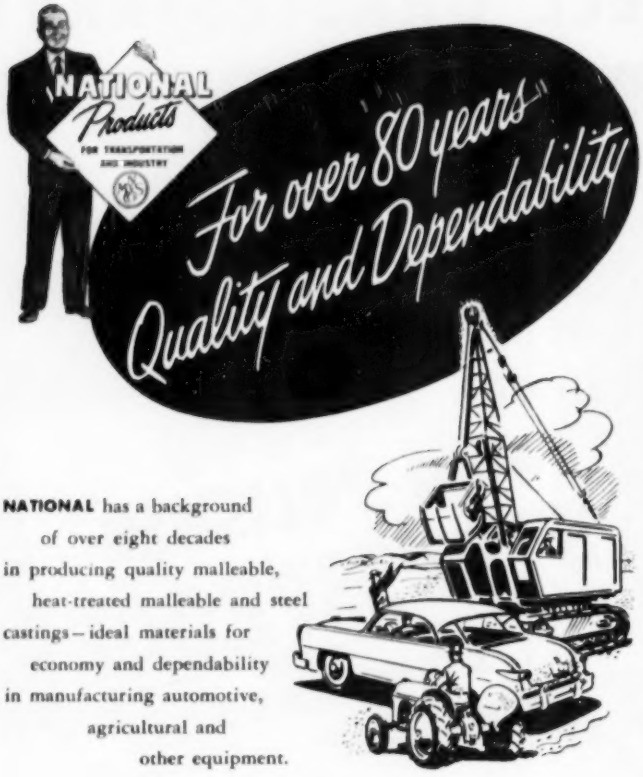
It is significant that the only suitable substitute for STRESSPROOF is an alloy steel requiring many additional expensive production operations.

STRESSPROOF
IS PLAYING A VITAL ROLE
IN NATIONAL DEFENSE!
A very large proportion of STRESSPROOF production, today, is going into defense jobs. However, sample bars are available for testing purposes.

La Salle STEEL CO.

1416 150th Street, Hammond, Indiana

Manufacturers of the Most Complete Line of Cold-Finished and Ground and Polished Bars in America



NATIONAL has a background of over eight decades in producing quality malleable, heat-treated malleable and steel castings—ideal materials for economy and dependability in manufacturing automotive, agricultural and other equipment.

NATIONAL's unparalleled experience—coupled with a continuing metallurgical research program, rigorous quality control standards, and completely mechanized foundries in strategically located cities—is at your disposal.

Sales offices and engineering facilities are located at all five plants listed below.

A 16mm technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings. A-5017

PLANTS LOCATED IN

Sharon, Pa., Cleveland 6, Ohio, Indianapolis 6, Ind., Melrose Park, Ill., and Chicago 50, Ill.

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO

NATIONAL Products

Turner was also vice president in charge of industrial relations, where he has been succeeded by **Robert D. Blasier**, who was elected a vice president. **John E. Payne** was elected vice president, in charge of the central sales district, Pittsburgh. He had been manager of the district. At Buffalo, Mr. Turner succeeds **L. R. Botsai,** who resumes as manager of the company's Gearing Div., Pittsburgh. **G. H. McBride,** who served in Mr. Botsai's absence as Gearing Div. manager, resumes his previous position as sales manager of that division.

John A. Hartzell had been named sales manager, Engineering & Construction Div., Koppers Co., Inc., Pittsburgh, succeeding **Ward L. Gable,** retired. Mr. Gable will remain with Kopper as a special sales consultant. Other changes: **C. W. Mohme,** named assistant to the production manager; **C. K. Waibel,** sales engineer; **C. E. Mielke** and **H. A. Grosick,** contract engineers.

James W. Phillips has joined the Special Products Div. of Riverside Metal Co., Riverside, N.J., as a development engineer. He was formerly a design and development engineer for Electronic Tube Corp.

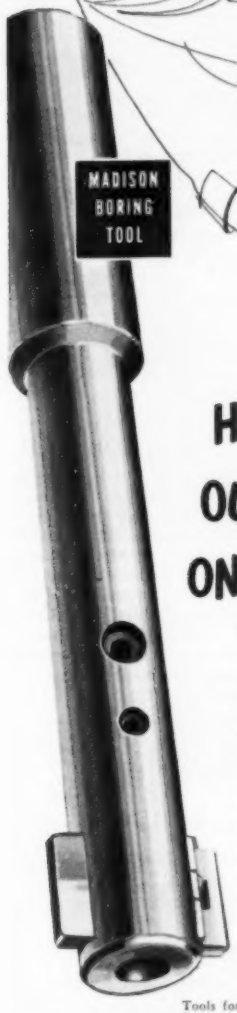
Willard J. Dye has been named assistant to the vice president of Hydropress, Inc. and Loewy Construction Co., Inc., New York. He had been with United States Steel Corp for 15 years.

Steven P. J. Wood has been elected executive vice president of Warner Electric Brake & Clutch Co., South Beloit, Ill. He joined the firm in 1946, was named vice president in 1949.

E. D. Tull has been named to the newly created position of vice president for personnel and plant, Cummins Engine Co., Inc., Columbus, Ind. He has been manager of manufacturing since April, 1950. He went to work in the Cummins shop in 1928, was named machine shop foreman in 1938, machine shop superintendent in 1940 and, in 1942, became assistant works manager. The new division he now heads will be responsible for all personnel activities and plant construction and maintenance.

Foster W. Lamb has been named general sales manager, Automatic Transportation Co., Chicago. He began his career with Carnegie Steel Co., later was with Allegheny Ludlum and Jones & Laughlin. He was assistant to the sales vice president

let the man with holes in his head ...



HELP YOU STAY OUT OF THE *RED* ON YOUR BORING OPERATIONS

You'll find Madison men . . . "the men with holes in their heads" . . . are concerned with more than producing the finest, most efficient, boring tools for rough and finish boring.

They're thinking of ways you can do your boring jobs faster at lower cost with Madison tools. Take the Madison two-bladed cutter for instance. First, it provides generous chip clearance . . . permits faster cutting without overheating. That means more holes per cutter, longer tool life, hence lower tool cost. Second, the Madison finishing cutter is floated in the bar . . . thus saves the cost of special tool holders. And Madison cutters save time too!! You change them without disturbing the set-up. Ask the "men with holes in their heads" to cut your boring costs. A brief letter will do. And no obligation, of course.

Write for Madison's information-filled Borereaming catalog.

Tools for rough boring; finish boring; combination rough and finish boring, multiple cutting, bottoming; and other special tools.

MADISON MANUFACTURING CO.

DEPT. AM **MUSKEGON, MICHIGAN**

Increase Tool Life

...Here's HEAT TREAT equipment to make tools more productive

Packed with helpful information, Bulletin SC-151 tells how 'Surface' Standard Rated Furnaces are applied to tool room heat treat needs.

ATMOSPHERE FURNACES

Bolco, Char-Mo, Atmotrol for clean, scale-free hardening, gas carburizing and dry cyaniding.

MUFFLE FURNACES

For use with protective atmospheres to prevent scaling and decarburization.

POT FURNACES

For hardening, cyaniding, liquid carburizing, drawing or interrupted quenching.

OVEN FURNACES

For direct-fired general heat treating or heating operations.

CONVECTION FURNACES

For drawing or tempering of tool steels.

'Surface'

COMBUSTION CORPORATION

TOLEDO 1, OHIO

of Colorado Fuel & Iron Corp. In 1948 he became general sales manager for Templeton, Kenly & Co. For the past two years he had been product sales manager, Buda Co.

Leonard T. Sylvester, president and managing director of Mathews Conveyor Co., Ltd., a Canadian subsidiary of Mathews Conveyor Co., Ellwood City, Pa., has been elected president of the parent company. **Odd H. McCleary,** vice president, was elected vice president and general manager. **Lee Sekulski,** sales manager, was elected to the board of directors. **Frank E. Moore** remains as chairman. Mr. Sylvester will continue as president of the Canadian Co. and will direct operations there. Mr. McCleary will be in complete charge of all operations at Ellwood City.

Paul W. Rhame has been named general manager, Rochester Products Div., General Motors Corp., succeeding **Ralph B. Knight** who will be on special assignments until his retirement June 1. Mr. Rhame was plant manager, AC Spark Plug Div., at Milwaukee.

John S. French has been named director, Office of Defense Products, Ford Motor Co., succeeding **Richard E. Krafve,** recently named executive assistant to the vice president and general manager and the operations manager of Lincoln-Mercury Div.

Dale C. Doty has been named director of purchases for Skilsaw, Inc., Chicago. **John L. Schuler** succeeds Mr. Doty as purchasing agent.

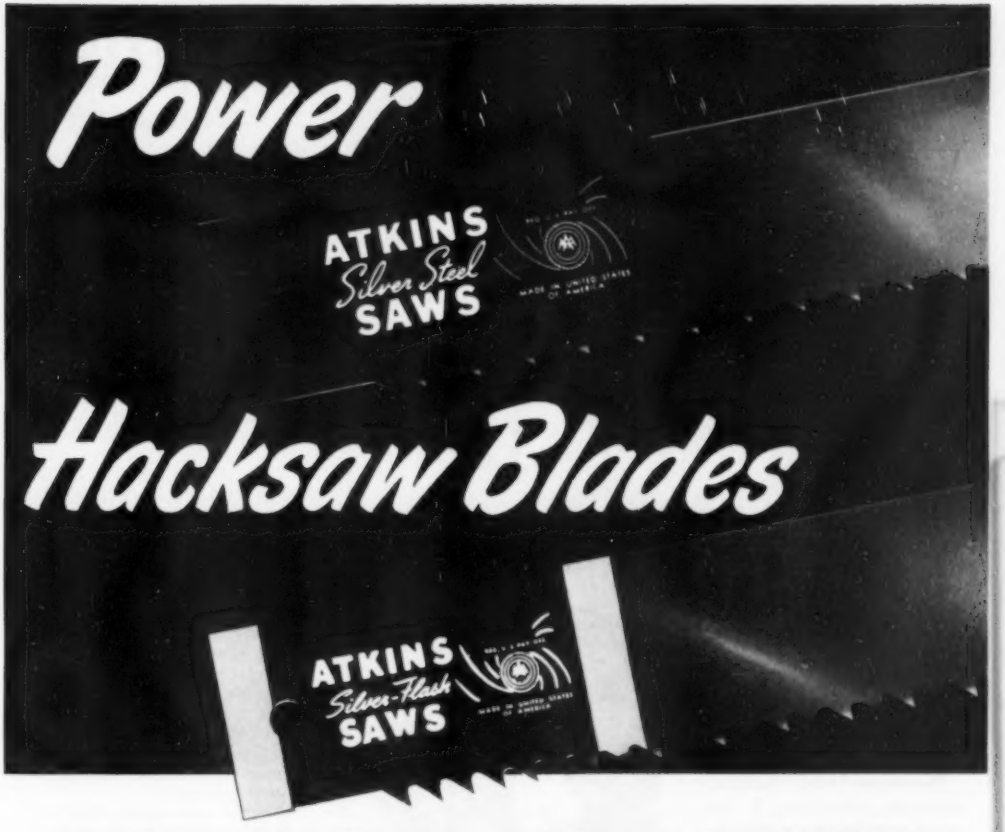
A. B. Diss has been named vice president in charge of manufacturing, Watson-Stillman Co., Roselle, N. J. **R. S. Sweeney,** vice president and treasurer, has been elected a director. **James W. West, Jr.,** a director, has been named assistant to the president. Other changes: **R. W. Dinzl,** consulting engineer; **Adolph deMatteo,** chief engineer; **R. W. Schreck,** general manager of sales, Hydraulic Div.; **Herbert E. Elliott,** sales manager, Hydraulic Div.; **John P. Bittenbinder,** sales manager, Distributor Products Div.; **Walter R. Biedermann,** industrial engineer; **Elsworth Falkenberg** plant manager; **Eric Nelson,** plant superintendent; **A. Walters,** production manager, Hydraulic Div. **Richard M. Norman** has joined the Hydraulic sales dept.

Arthur Paine has been named chief, Aircraft Design Div., Bristol Engineering Corp., Bristol, Pa. **Karl Koehler** was named chief, Mechanical Design Div., and **George Dixon,** chief, Electronics Div.

Michael C. Turkish has been named chief engineer, Coil Spring Dept., Spring Div., Eaton Mfg. Co., Detroit.

James A. Nelson has joined American Machine & Foundry Co., New York, as manufacturing assistant to the vice president and general manager of the General Products Div. He will supervise, in a staff capacity, manufacturing operations of several AMF subsidiaries including DeWalt Inc., Cleveland Welding Co., Junior Toy Corp., Sterling Engineering Co., and the Float-Lock Corp. Since 1947 he has been technical manager of Cribben & Sexton Co.

YOUR MEN WORK TOGETHER SO SMOOTHLY—LOOK HOW THEY ARE HELPING THAT ENGINEER. THAT IS COOPERATION"
THANKS. NOW WOULD YOU STROLL ALONG WHILE I HELP HIM A BIT MORE?
"KILLING WITH KINDNESS"



To Save You Money and Serve You Better!

Here is the original high grade hacksaw blade—the blade that has stood the toughest tests of time for more than a quarter of a century! . . . For tough, high carbon steels it is unsurpassed by any blade in the world! It reduces costs by delivering more sawing per blade.

Unequaled for sawing lower alloy steels! Tough, yet exceptionally flexible. Here's a blade that will give you fast, clean cutting to very close tolerances—and with the very minimum of breakage and chipping! Invaluable where high production is essential!

Use—Don't Abuse—Fine Tools!

ATKINS

E. C. ATKINS AND COMPANY

402 South Illinois Street • Indianapolis 9, Indiana

ONLY

GOSS and DELEEUW AUTOMATIC CHUCKERS

offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DELEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ROUND TABLE Discussion

NEW EYES

Ed is trying the experiment of letting a worker do nothing for one day but look for improvements in the shop. Is this practical? Will the average worker waste the time or will he come up with some worthwhile ideas? Do you agree with . . .

ED'S IDEA to have a man do nothing for one day but look for improvements is not a good one. Suggestions to raise production don't mature so suddenly. This is as a rule a problem of foresight. And what kind of a man is Benner anyhow? Has he made some suggestions before, or is this an attempt to find out if he is able to do so? At any rate, to have a single man looking around a day to see where improvements might be made won't give good results unless it is partly prepared beforehand. It seems to me that Ed is using handicraft methods where mass production principles might be applied.

Ed should organize mass thinking among his men. Then he will get suggestions he can probably use. To awake the whole shop to the task, he must reward the working force for that extra effort.

If Ed is overcrowded with work, it is best for him to get an assistant to help him. This does not eliminate the suggestions of others. What type of assistant he needs depends, of course, on what kind of work he has to do besides his leading the men. If he has a lot of writing to do, he needs an office man, but if he is unable to plan his work properly, he should have a tradesman with executive ability to assist him.

If Al's head is full of ideas but he doesn't have time to attend to half of them, he is a poor organizer. Why not jot them down on a piece of paper and put it on the bulletin board and invite anyone to suggest a solution for each of them? Should it be found that some of them are impractial, even this should be stated by the men taking part. Many of Ed's men are probably capable of assisting him in putting ideas into practice. Benner alone, however, is perhaps not sufficient for the task.

No sensible man will enlarge his dome just because the foreman uses him to solve some problems. And Ed ought to know if the man selected will waste his time in telling jokes.

Where the going is TOUGH . . .

SPECIFY FARREL GEARS

Precision generation combined with the use of highest grade materials gives Farrel herringbone gears the ability to withstand the heaviest shock loads encountered in machine applications.

Accuracy of tooth contour and tooth spacing, overlap or interlacing of the teeth, gradual engagement and inclined line of pressure contribute to smooth operation and maintenance of correct tooth action throughout a long gear life. The opposed helices balance and absorb axial thrust within the gear member, preventing harmful thrust loads with resultant stresses on other parts of the machinery.

Farrel engineers are available to assist in working out unusual gear problems. Information about herringbone gears, or any of the other types mentioned on this page, will be sent on request.

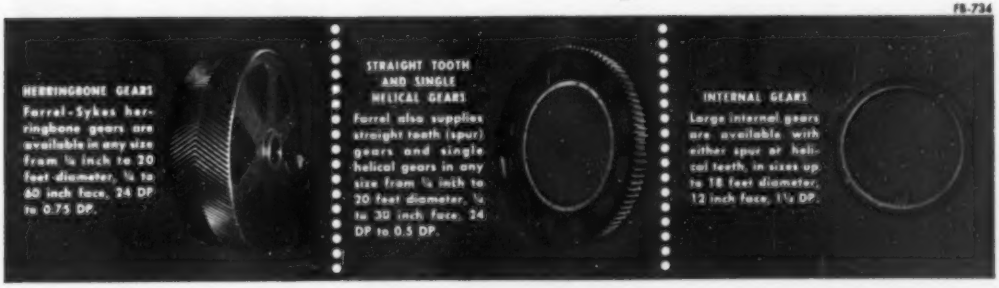
FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

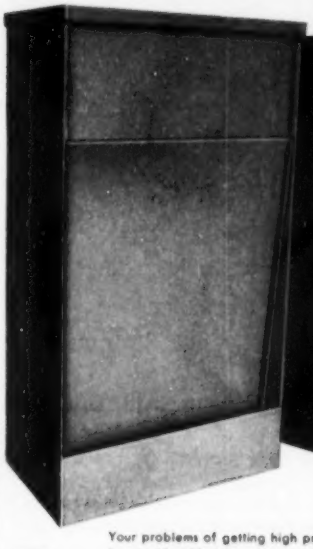
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham®

FB-734


HERRINGBONE GEARS
Farrel-Sykes herringbone gears are available in any size from ¼ inch to 20 feet diameter, ¼ to 60 inch face, 24 DP to 0.75 DP.
STRAIGHT TOOTH AND SINGLE HELICAL GEARS
Farrel also supplies straight tooth (spur) gears and single helical gears in any size from ¼ inch to 20 feet diameter, ¼ to 30 inch face, 24 DP to 0.5 DP.
INTERNAL GEARS
Large internal gears are available with either spur or helical teeth, in sizes up to 18 feet diameter, 12 inch face, 1½ DP.

get more uniform work pieces from PROPER MACHINE TOOL TEMPERATURE CONTROL!



NEW OIL COOLER

specifically designed to control temperature of production machinery

Your problems of getting high production from your machine tools will be considerably lessened by the use of this new OIL COOLER. It has proved in actual production jobs that it can, through refrigeration, control the temperature of cutting oil or coolant, lubricating oil and hydraulic oil.

These advantages can result from its use . . .

- Uniform Work Pieces
- Uniform Oil Viscosity
- Longer Tool Life
- Less Tool Grinding
- Less Adjusting Time on Machines
- Cooler Work Pieces to Handle and Gauge
- Reduction of Oil Evaporation
- Increased Capacity

SEND FOR COMPLETE INFORMATION

Taco

TACO HEATERS, Incorporated

137 SOUTH STREET, PROVIDENCE 3, R. I.

That kind of man cannot be of any help. All the men in a shop should be permanently encouraged to tell their foreman of improvements they think will increase production.

A. E. Fristedt
Stockholm, Sweden

•

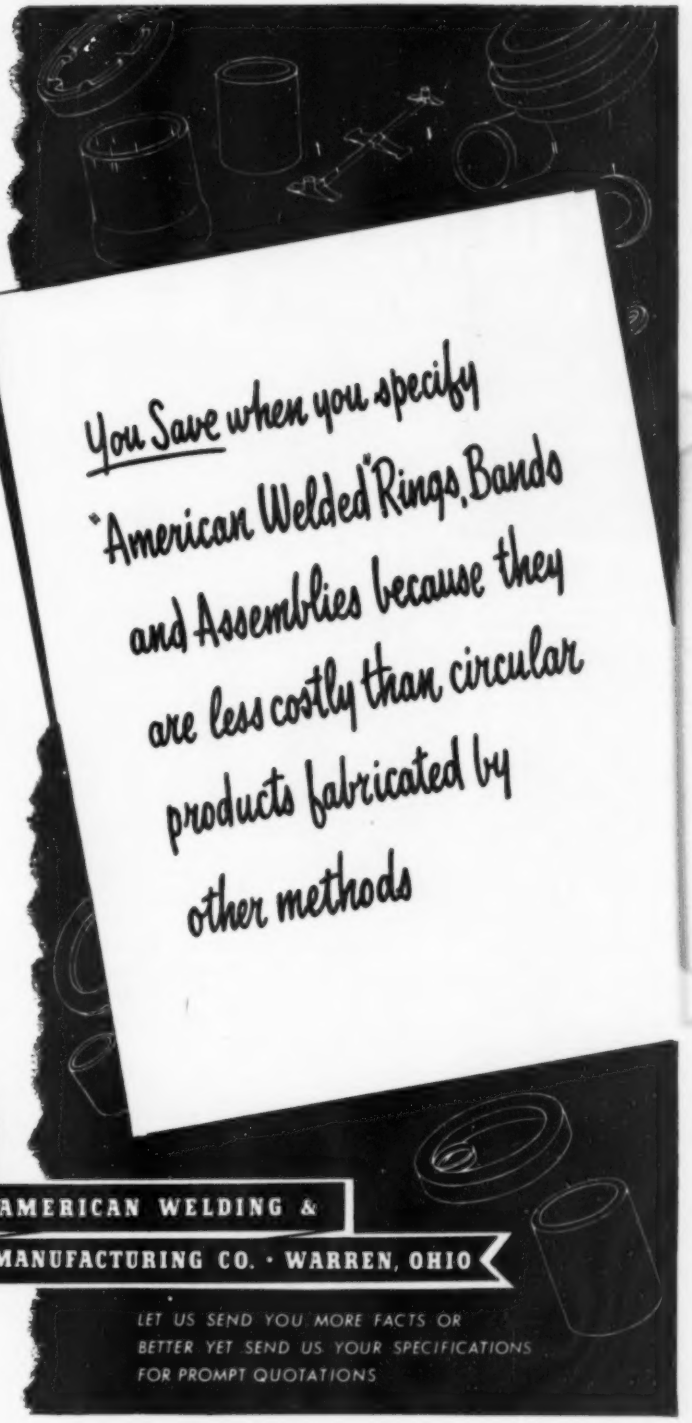
OFF AGAIN, ON AGAIN

No, I DON'T agree with Ed's method of trial, error and out the door you go. It seems very good practice to me to let a new man have at least one day getting acquainted with the shop, the men, and the work that will be expected of him. Not a day spent visiting, but one that is conducted in a businesslike manner. It could be part of a job given to one of the top hands who knows the shop or handled by the foreman himself. Give the man some confidence and let him know you are putting him where he will do the most good.

After the day of finding what work will be expected, give him a selection of a couple of jobs and let Joe New choose his job. Perhaps he will pick out the difficult task, but from experience I find that they will usually take the job that will give them a chance to feel out the equipment and begin to establish a routine that is so necessary in a good man.

Some say that this is a waste of time but I don't believe it, if you choose your men for the jobs that you have to perform. A new man usually doesn't botch the work he has to do because of eagerness to please with speed, but usually makes these preventable mistakes because he is not familiar with what is expected of him. Given an opportunity

"Sure it's a 1-in. 'Mike' job, but the salesman sold him on the jumbo economy-size micrometer!"



GO "AMERICAN" FOR CIRCULAR WELDED PRODUCTS

You Save when you specify "American Welded" Rings, Bands and Assemblies because they are less costly than circular products fabricated by other methods

A company you'll like to deal with

THE AMERICAN WELDING & MANUFACTURING CO. · WARREN, OHIO

Send for your copy of our 20 page illustrated catalog

LET US SEND YOU MORE FACTS OR BETTER YET SEND US YOUR SPECIFICATIONS FOR PROMPT QUOTATIONS

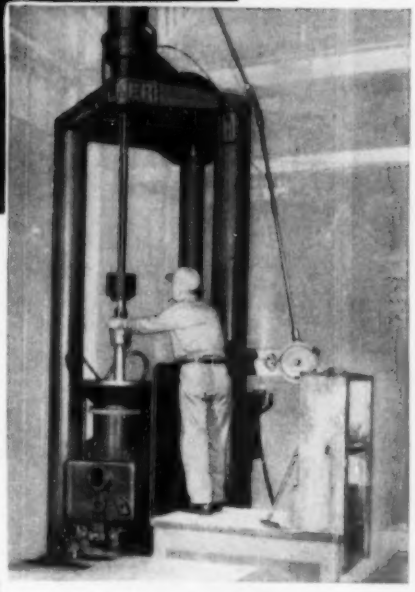
RUBBING OR GRINDING TAKE TOO LONG AND COST TOO MUCH

CUT AWAY FERROUS & NON-FERROUS METALS QUICKLY AND CHEAPLY WITH

FULMER HONING MACHINES

For practically every type of internal cylinders of cast iron, soft, alloy or hardened steels, monel metal, brasses and bronzes.

Hone as much as 1/16 inch of material at 1½ to 2 cu. in. per min.



ULMER HONING MACHINES generate true internal cylinders from ½" up to 30" diameter. Hones are self-aligning and remove rough surfaces by cutting away material to tolerances of .0001 (plus or minus) on size, straightness and roundness.

Illustrated by "live photo" is Continental Gin Company, Birmingham, Ala. honing Diesel cylinders. This company is the oldest and largest in the cotton gin industry and also build to highest limits of precision, textile machinery, diesel and gas engine components, machine tools and other miscellaneous equipment requiring the finest workmanship.

CHIPS CAN BE AMAZINGLY LARGE—AS LONG AS 6 INCHES. Photo shows chips removed from steel hydraulic cylinder and proves how FULMER HONING MACHINES actually cut away stock.

•

Fulmer . . . and Only Fulmer Offers Complete Honing Equipment in "One Package" Machines . . . Hones . . . Stones . . . Fixtures . . . Tools

FREE . . . WRITE NOW Illustrated, technical manual: "What to Know About Honing."

C. ALLEN FULMER CO.

107 EAST FOURTH STREET **CINCINNATI 2, OHIO**

to run the machine he will be on, or even talk to some of the hands that have had the experience of operating it, will give a degree of confidence that will soon pay for itself in the caliber of work returned.

Take a look at the baseball leagues. Do they take a man just because he has been batting .456 all season in some sand-lot league and throw him into the regular lineup? Not on your life! They work him in slow, get him used to the club he is with and the manner in which they operate, then begin to ease the pressure on until he is in the form for which he was hired. They play for big chips in these leagues and the successful foreman should do likewise because the success that will come to him is largely due to the success of the men he has on the gang.

Given a short length of time to prove their worth, almost all of the good mechanics that I have ever met were able to out-produce the results that they wrote about on the application blanks. I think that Ed should spend a very small percentage of his time remembering when he was on the way up, and how strange he felt when he was in a new environment, and what a few kind words and a pat on the back would mean at the end of the first couple of days. Not only would he help the men, but the time would be well spent because he could then see that high pressure all of the time can spoil more work than some small consideration.

Jack Bell
Bakersfield, Calif.

•

BARGAIN SHOPPER

THE PRACTICE of hiring a man out from under someone else could be prevented if all of us would use some sense when we let a man go. Make it a general practice to give a man a termination card. It doesn't have to be a letter of recommendation, but if he is good it wouldn't do any harm to mention the fact that he is a crackerjack and that whoever got him would be that much to the good. But there are lots of fellows who spend their time looking for some place where the hours are better, the shop cleaner, or some other excuse to scratch those itching feet. If one of the requirements for all hands would be a form card saying that he was free to be hired, it would save a lot of embarrassment and future trade enemies.

This is not an attempt to revolutionize the industry, but merely a suggestion to do away with job stealing. It was a practice that was car-

McKAY

WALKER BROTHERS, of CONSHOHOCKEN, PA., have earned their reputation as manufacturers of quality conduit and electrical raceway tubing through years of serving the electrical industry. To maintain this position, it requires constant and rigid inspection—an alertness to new methods and the use of quality equipment.

McKAY is proud to have had their tube mills selected by WALKER. Experience gained after producing millions of feet of conduit on McKay tube mills, has proven conclusively that they can rely on McKay equipment to maintain their high standard of quality and keep pace with the ever increasing volume demanded by industry.

If your product is tubing it will pay you to investigate McKay equipment for greater yield—higher quality product — lower maintenance — and less down time.

The McKay RS-525-150 KVA Electric Weld Tube Mill with McKay Rotary Saw Cutoff

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

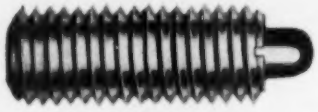
The McKAY MACHINE *Company*

YOUNGSTOWN, OHIO

ASSOCIATED WITH WEAN ENGINEERING CO., INC.

VLIER Spring Plungers & Stops

Save You Money in Hundreds of Ways



Here are the perfect units for replacing "make-shift" plungers in production and for end product use. Widely used for positioning small parts in fixtures, breaking oil seal in dies, as a locating pin, detents, etc. These units have long life and give trouble-free performance. Economically priced. There is a nearby Vlier distributor to serve you. Write for Catalog No. 51 today.

Completely assembled units, available in 13 sizes.

Pre-set, constant (3-42 lbs.) spring pressures.

Hardened plungers and rust-proof finishes give long life.

True plunger alignment in all positions.

Accurately-radiused plunger fully telescopes into body.

National Coarse Thread No. 1 fit prevents "freezing."

SPRING STOPS

For use where fixture design prevents the mounting of spring plungers. Body is jig-drilled for bolting to fixture-base. Has case-hardened, radiused nose. Available in two sizes with 14 or 32 lbs. spring pressure.

VLIER MANUFACTURING COMPANY

4337 Beverly Blvd., Los Angeles 4, Calif.

Manufacturers of Torque Thumb Screws; Fixture Keys; Toggle Pads.

ried on quite extensively during the last war and was the means of some high-class toolrooms getting all of the top hands. If someone working for me is dissatisfied with his job for any reason, I would be the last one to stand in his way of finding a new one. In fact, if he were any good at all, I would help as much as possible in helping him find a suitable spot. All of us know that there are a few, and I am being very conservative when I say a few, outfits who will tie the can on a man because he is looking for another job. Can we blame them for doing it on the sly? Why create this distrust among the men when it will be to our own advantage to have the gang satisfied? If a man is a misfit or does not feel like he belongs, or is not satisfied with his job, it will surely show in his work. Sure, he may be the best of hands, one that makes the rough spots appear much smoother, but his lack of interest will soon show in his work and more than likely will spread to those around him.

This country of ours has too big a job to do now and in the years to come to spend any of our time on distrust of the competition. All business needs good, stiff competition to bring out their best but we can do it in an open manner and please more than just the one shop.

I believe that by working together, helping each other find the right man for each job, is the answer to top production. If we have someone who would like to work elsewhere and can perhaps better himself by the change, why put stumbling blocks in his path? When the pros-

(*Continued on page 229*)

"That machine drills, reams, taps, bores, faces—and then Trumbull knocks the burr off!"

MORE THAN IMPROVEMENTS

IT TOOK A RADICAL ADVANCE IN BASIC CONTACTOR DESIGN TO MAKE POSSIBLE ALL THESE IMPORTANT FEATURES

IN THE ARROW AH HART "CRA" TYPE

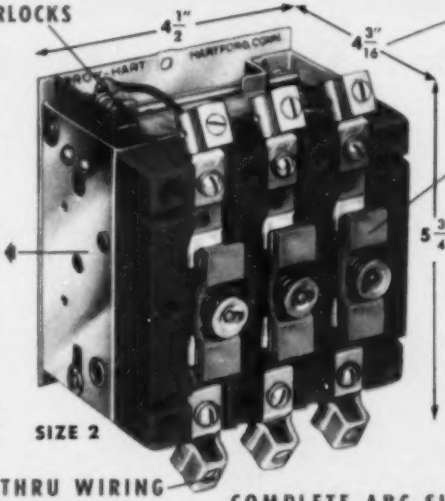
MAGNETIC CONTACTOR

ELECTRICAL INTERLOCKS

Various combinations of these auxiliary switches can be installed without increasing overall contactor size. They provide extremely flexible circuit control and make easy the arrangement of every sort of interlocking devices.

EXCLUSIVE "RA" MECHANISM

This first *real advance* in contactor design in over 20 years accounts for many of the "CRA" plus features. Working thru a bell-crank fulcrum, a much smaller magnet easily outperforms old direct acting types.



SIZE 2

HALF THE SIZE

Reduced control size is the answer to today's demand for increased power in limited space. Here is new design freedom, new compactness for panel-boards and other centralized control installations.

RUGGED CONTACTS

Special silver alloy tips withstand severe punishment. Horizontal closing action eliminates wasteful lifting against gravity; guided travel assures positive alignment. Vertical operating position prevents accumulation of breakdown materials.

STRAIGHT-THRU WIRING

This *in-built feature* — NOT just a bus-bar hook-up — makes possible space, time and work savings up to 30%. Looping and U-bending are eliminated; circuit identification is immediate and positive.

COMPLETE ARC SUPPRESSION

Molded alkyd base and hood have phenomenally high arc and tracking resistance. Tongue-and-groove construction completely isolates individual arcing chambers. In the Size 4, individual high heat and arc resistant chutes and baffle plates are provided.

BUILT-IN DEPENDABILITY

Because complex automatic sequence operations, vital safety devices and a host of other important electrical applications depend on contactors for their proper functioning, no detail of design, material or careful manufacture that can contribute to the reliability of Arrow-Hart Contactors is overlooked.

THE MOST ADVANCED CONTACTOR ON THE MARKET

ARROW AH HART

BUY WITH CONFIDENCE • PROFIT BY PERFORMANCE

THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD 6, CONN., U.S.A.

THE ONLY ANSWER TO ALL YOUR CIRCUIT CONTROL REQUIREMENTS

THE COMPLETE LINE OF ARROW AH HART "CRA" MAGNETIC CONTACTORS

- **ALL SIZES** 00 thru 4, ½ to 100 H.P., 10 to 150 Amps.
- **REGULAR AND REVERSING MODELS** — In all sizes.
- **A FULL LINE OF ENCLOSURES** — General Purpose NEMA Type 1, Explosionproof, NEMA Type VII, Weatherproof NEMA Type IV, Explosive Dust NEMA Type IX, Dust Proof NEMA Type V.
- **FOR ANY TYPE OF CONTROL**

Arrow-Hart "CRA" Contactors can be controlled by a variety of manual or automatic switches and instruments, locally or from one or several remote positions. Both 2- and 3-wire control circuits are commonly used. The former, providing under voltage release, is preferable where automatic restarting with restoration of power is advantageous. 3-wire control utilizing a holding circuit provides under voltage protection. This system which requires manual restarting after current failure prevents sudden unscheduled starting with possible danger to operator or machinery.

"CRA" SELECTOR GUIDE

"CRA" Unit	Poles	Auxiliary Holding Switch	Extra Auxiliary Switches	Amperes Per Circuit		Maximum H.P. Ratings			
				Without Enc.	With Enc.	110V	220V	440-550V	
Size 00	1-6, Convertible N.O. or N.C.	None	No	10	9	½ ¾	¾ 1	— 1	Single phase Poly-phase
Size 0	2-5, all N.O. or one N.C.	Optional	Yes	15	13.5	1 1½	1½ 2	1½ 2	Single phase Poly-phase
Size 1	2-5, N.O.	Optional	Yes	25	22.5	1½ 3	3 5	5 7½	Single phase Poly-phase
Size 2	2-5, N.O.	Yes	Yes	50	45	3 7½	7½ 15	10 25	Single phase Poly-phase
Size 3	2-5, N.O.	Yes	Yes	100	90	7½ 15	15 30	25 50	Single phase Poly-phase
Size 4	2-5, N.O.	Yes	Yes	150	135	—	50	100	Poly-phase

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"CRA" CONTACTORS and about the complete Arrow-Hart Motor Control Line. There is an A-H unit for every circuit requirement including: "RA" Starters, Push Button Stations, Manual Starters, Fractional Horsepower Starting Switches and Push-Pull Selector Switches.

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INDUSTRIAL CONTROL DIVISION
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Piston-Engine Program Hit Hard As Military Goes All-Out on Jets

WASHINGTON — Recently aircraft and engine makers gathered at the Pentagon to get the bad news about the top decision to stretch out the arms buildup. Up until that decision was made, the plans called for more production capacity and more development on both jets and piston engines. But Truman's new ceiling of $51-billion on military spending meant that the brass had to choose between them. And they made the choice the military always makes, and probably should make: combat planes are favored, noncombat planes cut back hard.

Translated into engines this means that the piston-engine plane programs are hit hardest—transports, trainers, and the like. On the other hand, the Navy and Air Force both are committed to making every combat plane a jet as soon as possible: fighters, interceptors, fighter-bombers, bombers, and even anti-submarine and patrol bombers.

Naturally, this goal can't be reached overnight. But as of now, piston-engine combat models are being "phased out." For the B-36, for instance, this means that production doesn't finally peter out until 1955.

This week, the brass at Wright-Patterson Air Force Base in Dayton,, Ohio, spelled out what this means to the aircraft and engine makers, the auto industry, and the metalworking industries generally.

Peak production rates previously planned were knocked down by around one-third for the plane and engine makers, by two-thirds or more for the secondary sources of supply, the auto companies.

• **Here are some of the cutbacks** on engine schedules:

Ford Motor Company's contract to produce Pratt and Whitney piston engines in Chicago was cut 74% —but it got a new $30-million contract to build jets in the same plant.

General Motors' Buick Division was cut back two-thirds on planned production of British Sapphire jets at Flint, Mich.; its Chevrolet Division plans to build piston engines at Tonawanda, N. Y., was reduced 55%.

Packard and Studebaker peak schedules for jet production in Utica, Mich., and South Bend, Ind., were cut 40%.

Nash-Kelvinator contracts for piston engines were cut 32%.

On the other hand, Wright Aeronautical's contract for making the British Sapphire jet engine, was cut only one-third, compared with the two-thirds cut on the Buick schedules for the same engine.

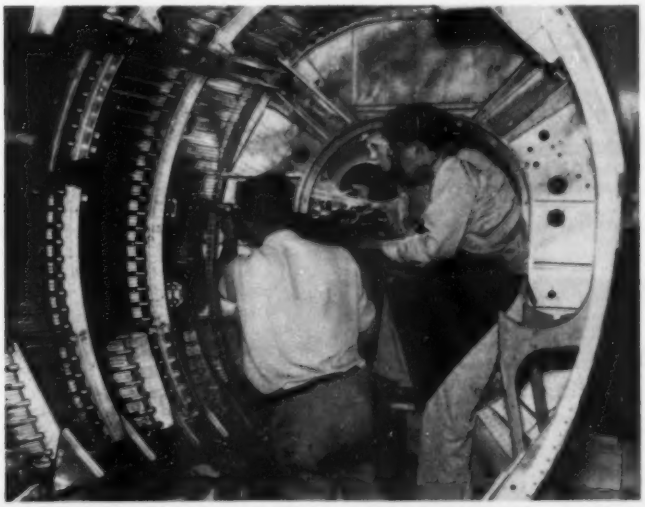
Over-all, the Air Force officers agree that there are no job layoffs involved in the cutbacks on production schedules. Output of both planes and engines will increase steadily until mid-1953, then level off and hold through 1955. Previously, plans called for higher peak rate of production and completion by 1954.

• **One trend of the stretch-out,** of course, is to bring more of the subcontracts back into the prime contractor's own plant. But just how far this will go is hard to say. Aircraft and engine makers both are normally big subcontractors.

The clashing of gears as top planners shift into lower gear, and the publicity on our plane performance in Korea makes for continual criticism of our "low jet output." But this leads to the question righ at the heart of the whole mobilization cutback: "How badly do we need the stuff?"

As long as we are actually fighting with jets, we need at least enough to match the enemy's numbers. For that reason, among others, the Air Force would like to freeze production—of the more powerful models now in the "pre-production" stage —and then grind them out.

• **On the other hand,** they know the Russians don't have a lot of the complications we do when it comes to switching designs—i.e., the problems of dealing with free enterprise, independent labor unions, and the like. They can stop and start all without undue attention to internal economic and political considerations. So that means making the best compromise you can between quantity and quality, always with one eye on how the Russians are doing on both scores.



Aircraft nacelle built entirely of stainless steel by Solar Aircraft Co., San Diego, Calif., under a subcontract from Lockheed, is used in the P2V-5 Navy patrol bomber. In past engine nacelles have usually been made of aluminum but Solar, using a very hard form of stainless, has increased the structural strength without a substantial increase in weight of the assembly

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148,000

★NILSON 4-Slide

Cat. No. S-1-P

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METHOD	NUMBER OF MACHINES	HORSE POWER	DAILY OUTPUT
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★ Nilson 4-Slide Machine	1	2	148,000

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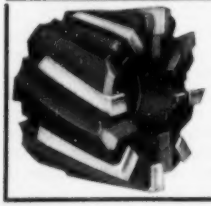

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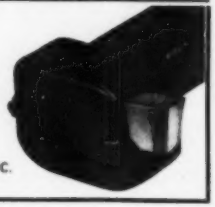

APEX TOOL & CUTTER CO., INC.

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subcontracting NEWS

ACF's St. Charles Plant Will Make B-47 Parts for Douglas Aircraft

NEW YORK—The St. Charles, Mo. plant of American Car & Foundry Co., will fabricate subassemblies for the Douglas Aircraft Co. in connection with the Boeing-designed B-47 production program. Called the Stratojet, the B-47 is the fastest bomber now in production.

The sub-assembly consists of the aft section of the fuselage. When completed by ACF they will be shipped intact for final assembly elsewhere. Work, except for certain fittings, will be aluminum fabrication.

Chrysler's Airtemp Division To Make Range Finders for Tanks

DETROIT — Chrysler Corp.'s Airtemp Division has been awarded two multi-million-dollar contracts for Army tank equipment. Both contracts were placed by the fire control division of the Army Ordnance Corps. Actual dollar value of the contracts was not disclosed.

One of the contracts calls for immediate production of T-41 range finders for meduim tanks. The other contract calls for T-46 range finders and T-30 computers for T-48 tanks. This work requires tooling and production will not start until next fall.

Kaiser Aluminum to Operate Giant Forging Presses

OAKLAND, Calif.—Kaiser Aluminum & Chemical Corp. has signed a letter contract with the Air Force for construction of facilities at the company's Newark, Ohio plant for two giant forging presses to mass-produce aluminum aircraft parts for the Air Force's airframe and engine contractors.

The presses—one standing nine stories high and rated at 35,000 ton and another of 25,000 ton hydraulic pressure—are part of the government's current $210 million "heavy press" program to speed up aircraft production.

Scheduled production of the new presses is a minimum of 3-million lb of forgings per month. The new closed-die 35,000 ton press will be able to handle a 2500 lb block of aluminum and forge; for example, an aircraft wing spar 35-ft long, 6-in. wide and of any thickness.

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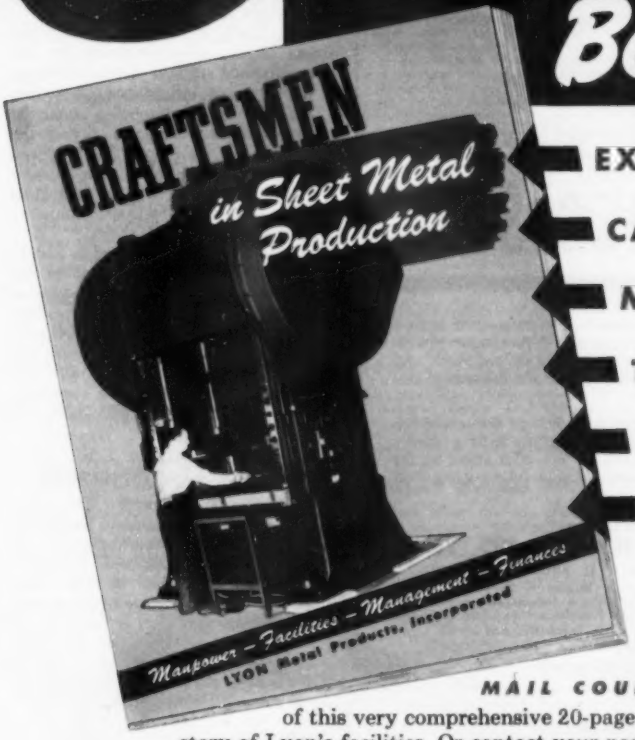

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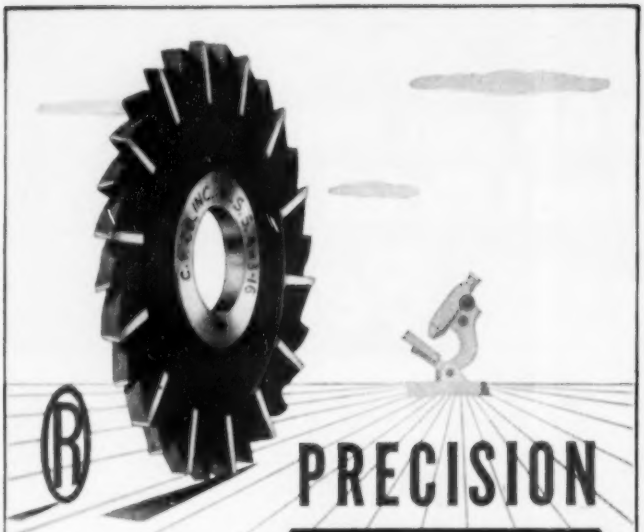
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks



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New York Commerce Dept. Lists 250 Firms for Subcontracting

ALBANY, N. Y.—The New York State Department of Commerce has initiated a new service aimed to expedite defense production and at the same time procure additional work for the state's metalworking industry through subcontracting.

In letters to more than 800 prime contractors in the Northeast, the department advised them of 250 firms having at least 700,000 open machine hours available on some 30 types of machine tools during the months of April through June, and invited them to place subcontracts with such firms. Another 270 firms will have additional open time on production tools generally.

The listing came out of a survey of 2700 metalworking firms in the state and includes such machine tools as profilers, gear shavers, grinders, jig borers, broaching machines, etc.

On request, prime contractors will be provided with individually tailored lists of firms having open time on machine tools specifically required by them.

San Francisco Port Procurement

WASHINGTON—Report from the Office of Small Business, San Francisco Port of Embarkation, shows large and small business received a total of $9¼ million in total value of Army Transportation Corps procurement at that port in the first half of fiscal year 1952. Of this total, small business obtained 93%. There were 4845 procurements during the period, with 4050 going to smalls.

Army and Navy Contracts

WASHINGTON — During the first five months of the 1952 fiscal year, 26.8% of the dollar value of Army contracts and 27.7% of the dollar value of the Navy's Bureau of Ships' contracts were awarded to small business. Of the work which the Bureau considered suitable for performance by small firms, 67.7% actually went to such firms.

Welding Capacity Available

PORTSMOUTH, N. H.—The Naval Shipyard here, has open welding capacity, particularly electrical welding, with limited supporting metal trades capacity, which will be available for an indefinite period.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank-Automotive Center, Detroit

Miller & Smith Mfg. Co., Inc., Albuquerque, N. Mex.—bulldozer, tank mounting, exceeds $250,000.

Detroit Ordnance District

Carboloy Dept., GE Co., 90-mm shot and metal parts assembly, exceeds $250,000.

Grinnell Screw Products Co., Detroit—percussion primers, $140,895.

Cleveland Ordnance District

Firestone Tire & Rubber Co., Akron, Ohio—muzzle brakes, $162,215, recoiless rifles, exceeds $250,000.

Perfection Stove Co., Cleveland—kit, heater, power plant, exceeds $250,000 on each of two contracts.

E. W. Bliss Co., Toledo, Ohio—cupola assemblies, exceeds $250,000.

Ohio Steel Foundry Co., Lima, Ohio—breech ring castings, $145,256, and exceeds $250,000.

B. F. Goodrich Co., Akron, Ohio—track assemblies for tanks, exceeds $250,000.

Chicago Ordnance District

International Register Co., Chicago—fuses, figure not available.

Oilgear Co., Milwaukee, Wis.—auto parts, figure not available.

Thor Corp., Chicago—shells, figure not available.

Toastmaster Products Div., McGraw Electric Co., Inc., Elgin, Ill.—fuses, figure not available.

New York Ordnance District

Supreme Knitting Machine Co., Inc., Brooklyn, N. Y.—metal parts, exceeds $250,000.

Regina Corp. Rahway, N. J.—fuses, exceeds $250,000 on each of two contracts.

G.M. Co. Mfg., Inc., Long Island City, N. Y.—metal parts assembly, 20-mm shells, exceeds $250,000.

Philadelphia Ordnance District

Baldwin-Lima-Hamilton Corp., Eddystone, Pa.—facilities, $100,000.

Bethlehem Steel Co., Bethlehem, Pa.—tube forgings, exceeds $250,000.

Crown Cork & Seal Co., Baltimore, Md.—spare parts for 20-mm gun, exceeds $250,000 on each of two contracts, and guns, automatic 20-mm, exceeds $250,000.

A. B. Farquhar Co., York, Pa.—spare parts, 81-mm mortar, $265,643, and 81-mm mortar with mounts and base plates, exceeds $250,000.

Fidelity Electric Co., Inc., Lancaster, Pa.—blasting apparatus, exceeds $250,000.

Rheem Mfg. Co., Lester, Pa.—cartridge cases, 75- and 105-mm, exceeds $250,000 on each of two contracts.

United Specialties Co., Philadelphia—bodies, grenade-rifle, $249,861.

Warren Webster & Co., Camden, N. J.—boosters, exceeds $250,000.

Fairmont Steel Corp., Philadelphia—forging jackets for 120-mm gun. Exceeds $250,000.

Midvale Co., Philadelphia—tube forgings for 120-mm gun, exceeds $250,000.

York Electric & Machinery Co., York, Pa.—75-mm shells, exceeds $250,000.

Los Angeles Ordnance District

Harvey Machine Co., Torrance, Calif.—fuses, exceeds $250,000, 20-mm shells, exceeds $250,000. Metal parts, exceeds $250,000.

Clary Multiplier Corp., San Gabriel, Calif.—boosters, exceeds $250,000.

Norris-Thermador Corp., Los Angeles—cartridge cases, 20-mm, exceeds $250,000.

National Supply Co., Torrance, Calif.—breech ring castings and tube forgings for 105-mm gun, exceeds $250,000. Breech ring castings, 120-mm gun, exceeds $250,000.

Cincinnati Ordnance District

Sefton Fibre Can Co., St. Louis, Mo.—ammo containers, 155-mm, exceeds $250,000.

Allison Div., GMC, Indianapolis, Ind.—modification kits, $158,163, cross-drive transmission, exceeds $250,000.

Called a fatigue tester, this stretcher-compressor developed and built by Lockheed Aircraft Co., can exert up to a ½-million lb squeeze. Pounding can be varied from 5 to 2000 times a min. Pressure comes from two sources, a cylindrical hydraulic jack on floor between men and a rotating unbalanced weight enclosed in steel structure at right

Air Force to Purchase Canadian-Made Sabre-Jet

OTTAWA, Canada — The U. S. Air Force will purchase a number of F-86E Sabre-Jet fighters being manufactured by Canadair, Ltd., of Montreal, it was announced recently by Canadian and American defense authorities.

Canadair, licensed by North American Aviation Co., to build the plane since 1949, will effect early delivery of such aircraft from current production. American deliveries are not expected to interfere with commitments to the RCAF and the RAF.

Engines and other equipment which had previously been purchased by Canada in the U. S. will be incorporated into these aircraft.

ARMY ENGINEER AWARDS

Chicago District Engineer

Caterpillar Tractor Co., Peoria, Ill.—spare parts (their equipment), $100,000. Spare parts, $213,000. Wheel tractors, $156,000.

Buda Co., Harvey, Ill.—spare parts, (their equipment), $100,000.

R. C. Le Tourneau, Inc., Peoria, Ill.—spare parts (their equipment), $103,000, two contracts.

Philadelphia District Engineer

AFC-Brill Motors Co., Philadelphia—generator sets, exceeds $250,000.

Crane Co., Philadelphia—manifold assembly, exceeds $250,000.

Wallace & Tiernan Co., Belleville, N. J.—water filters, exceeds $250,000.

Harrisburg Steel Corp., Harrisburg, Pa.—oxygen cylinders, exceeds $250,000.

Ralph B. Carter Co., Hackensack, N. J.—sewage ejector, $120,259.

Northeastern Boiler & Welding Ltd., Green Bay Wis.—steel water tank, $185,990.

Detroit Diesel Engine Div., GMC, Detroit—generator sets, $207,180.

Cleaver-Brooks Co., Milwaukee, Wis.—distillation unit, exceeds $250,000.

Proportioneers, Inc., Providence, R. I.—water-purification units, $103,881.

Hatfield Wire & Cable Div., Continental Copper & Steel Industries, Inc., Hillside, N. J.—electric lighting equipment, exceeds $250,000.

ARMY SIGNAL CORPS AWARDS

Philadelphia Supply Agency

Bridgeport Metal Goods Mfg. Co., Bridgeport, Conn.—flashlights, $137,500.

Crosley Div., AVCO Mfg. Co., Cincinnati—radio sets, exceeds $250,000.

Friez Instrument Div., Bendix Aviation Co., Baltimore, Md.—radiosonde, exceeds $240,000.

Garod Radio Corp., Brooklyn—radio sets, exceeds $250,000.

Industrial Television Inc., Clifton, N. J.—multimeters, exceeds $250,000.

Johnson Service Co., Milwaukee—radiosonde, exceeds $250,000.

(Continued on page 224)

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SIGNAL CORPS AWARDS . . . . . continued

Kings Electronics Corp., Tuckahoe, N. Y.—mounting, exceeds $250,000.

Lewyt Corp., Brooklyn, N. Y.—radio sets, exceeds $250,000.

McElroy Mfg. Co., Littleton, Mass.—test set, teletypewriters, $234,828.

Allen B. DuMont Labs, Inc., Clifton, N. J.—receiver-transmitters, exceeds $250,000.

Blake Mfg. Corp., Madison, Wis.—flashlights, $142,670.

Gits Molding Corp., Chicago—flashlights, $249,881.

Industrial Spring Corp., Chicago—dynamotor, exceeds $250,000.

Teletype Corp., Chicago—miscellaneous teletype parts, $247,733; reperforator transmitter, exceeds $250,000.

Niagara Searchlight Corp., Buffalo, N. Y.—flashlights, $186,200.

Rome Cable Corp., Rome, N. Y.—wire dispensers, exceeds $250,000.

Tele-King Corp., New York—radio sets, exceeds $250,000.

U. S. Mfg. Corp., New York—flashlights, $133,216.

P. R. Mallory & Co., Inc., Philadelphia—power supplies, exceeds $250,000.

NAVY AWARDS

Navy Purchasing Office, Washington 25, D. C.

Gould & Eberhardt, Irvington, N. J.—gear hobbers, $114,978.

Service Caster & Truck Corp., Albion, Mich.—fork-lift trucks, exceeds $250,000.

R. K. LeBlond Machine Tool Co., Cincinnati—motor-driven lathes, $310,512.

Consolidated Machine Tool Corp., Rochester, N. Y.—lathe, geared-head, $247,550.

Elwell-Parker Electric Co., Cleveland—truck, warehouse, $212,472.

Bureau of Ships, Washington 25, D. C.

Automatic Switch Co., Orange, N. J.—transfer switches, $142,232.

Insinger Machine Co., Philadelphia, Pa.—dishwashing machine, $175,385.

Electro Impulse Lab., Red Bank, N. J.—radio-frequency wattmeter, exceeds $250,000.

Hyde Windlass Co., Bath, Maine—steering gear follow-up system, $197,470.

J. D. Christian Engineers, San Francisco—windless anchor, electric, $151,190.

John Trumpy & Sons, Inc., Annapolis, Md.—50-ft utility boats, $145,000.

Electric Boat Co., Bayonne, N. J.—motor-generator sets, controllers and voltage speed regulators, $421,867.

Bureau of Ordnance, Washington 25, D. C.

W. L. Maxson Corp., New York—machine tools and production equipment, exceeds $250,000.

Aerial Products, Inc., Elkton, Md.—plant equipment, exceeds $250,000.

Lisson-Melen Co., Lynn, Mass.—adaptors for projectiles and rocket heads, exceeds $250,000.

Yardney Electric Corp., New York, N. Y.—adaptors for projectiles and rocket heads, exceeds $250,000, secondary batteries, $174,250.

Construction Battalion Center, Port Hueneme, Calif.

Kelvinator Div., Nash-Kelvinator Sales Corp., Los Angeles—refrigerators, domestic, $182,155.

Black, Sivalls & Bryson, Inc., Kansas City—steel tanks, $252,133.

Steelcraft Mfg. Co., Rossmoyne, Ohio—metal arch-rib buildings, $6,282,500.

subcontracting NEWS

Ships Parts Control Center, Mechanicsburg, Pa.

Fairbanks-Morse Co., New York—repair parts, diesel engines, $293,807.
Foster-Wheeler Corp., New York—repair parts for air ejectors, $148,449.
Allis-Chalmers Mfg. Co., Milwaukee—repair parts, centrifugal pumps, $159,851.
Harrison Radiator Div., GMC, Lockport, N. Y.—repair parts for heat exchangers, $299,376.

NAVAL AVIATION AWARDS

Philadelphia Supply Office

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—oxygen regulators, exceeds $250,000.
Rochester Products Div., GMC, Rochester, N. Y.—maintenance parts, $138,455.
Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford, Conn.—engine tools, engine spare parts, maintenance parts, exceeds $250,000 on 13 contracts in various amounts.
Hamilton Standard Div., United Aircraft Corp., East Hartford, Conn.—propeller tools, propeller spare parts and kit assemblies, exceeds $250,000 on six contracts in various amounts.
Thompson Products, Inc., Cleveland—pumps, $101,379.
Electroline Co., Philadelphia — connectors, $266,502.

Bureau of Aeronautics, Washington 25, D. C.

Continental Electric Co., Inc., Newark, N. J. —inverters, $176,752.
Roller Smith Corp., Bethlehem, Pa.—volt ammeters, $124,278.
Weston Electrical Instrument Corp., Newark, N. J.—indicator thermometers, $172,814 in two contracts.

AIR FORCE AWARDS

Air Material Command, Wright-Patterson AF Base, Dayton

Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn. — training units, $160,800.
General Electric Co., Syracuse, N. Y.—wave guides, $159,513.
Federal Telephone & Radio Corp., Clifton, N. J.—rectifiers, $106,627.
Fairchild Engine Div., Fairchild Engine & Airplane Corp., Farmingdale, L. I.—power plant, $94,935.
Basca Mfg. Co., Indianapolis—aircraft seats $98,773.
George K. Garrett Co., Philadelphia—aircraft hardware, $704,220.
C. H. Geiger Machinery Co., Dayton—drill presses, $462,378.
Cine Products Supply Co., Ashland, N. J.—photo equipment, $109,312.
Gibbs Mfg. & Research Corp., Janesville, Wis. —spare parts, $174,664.
Hyatt Bearing Div., GMC, Harrison, N. J. —roller bearings, $464,450.
Pfaff & Kendall, Newark, N. J.—mast, $209,972.
National Die Casting Co., Chicago—machinery and equipment, $224,000.
Saginaw Steering Gear Div., GMC, Detroit—machinery and equipment, $170,640.
Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—wheel assemblies, $171,994.
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AAF's new Manual of Exhaust Hood Design is the most complete engineering reference of its kind. Twenty-four pages of factual information; tables of exhaust requirements; dust concentrations and weights of collected material; and 61 photographs covering hood designs and applications for the metal working industries. Special sections include.

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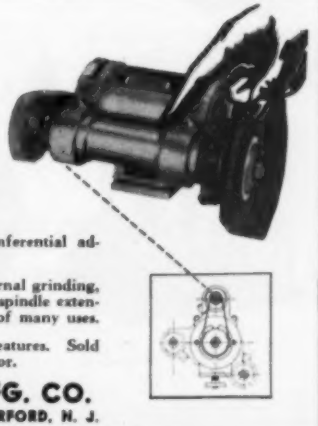

The dotted line points to the manually operated eccentric tube. This exclusive THEMAC feature provides proper belt tension at all times.

The sketch below illustrates the circumferential adjustment of Spindle Assemblies.

You can do any type of internal or external grinding, on any size lathe. The interchangeable spindle extensions make THEMAC Grinders a tool of many uses.

Write for catalog describing other features. Sold through your local mill supply distributor.

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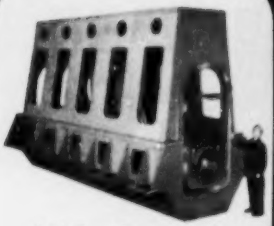

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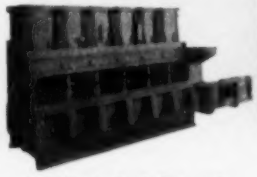

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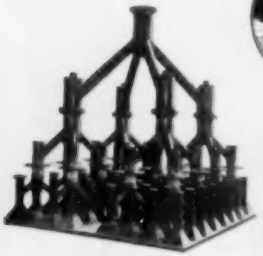

One of Several Parts of a Catalytic Cracking Plant Produced for the Petroleum Industry.

Use WELDED STEEL for Greater Strength with Less Weight!

Mass production of these massive clutch and drive housings for a twenty-one ton tractor is further evidence of the design trend in modern machines . . . it is a typical example of how alert manufacturers are today employing Steel-Weld Fabrication to good advantage in the construction of their products. Thousands of such heavy machinery parts and assemblies are now produced and machined by Mahon for many manufacturers throughout the country. If savings in either cost or time can be effected in your product through Steel-Weld Fabrication of parts, or, if you are cramped for manufacturing space, it will pay you to investigate Mahon facilities. You will find in the Mahon organization an unique source with complete, modern fabricating, machining and handling facilities for any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

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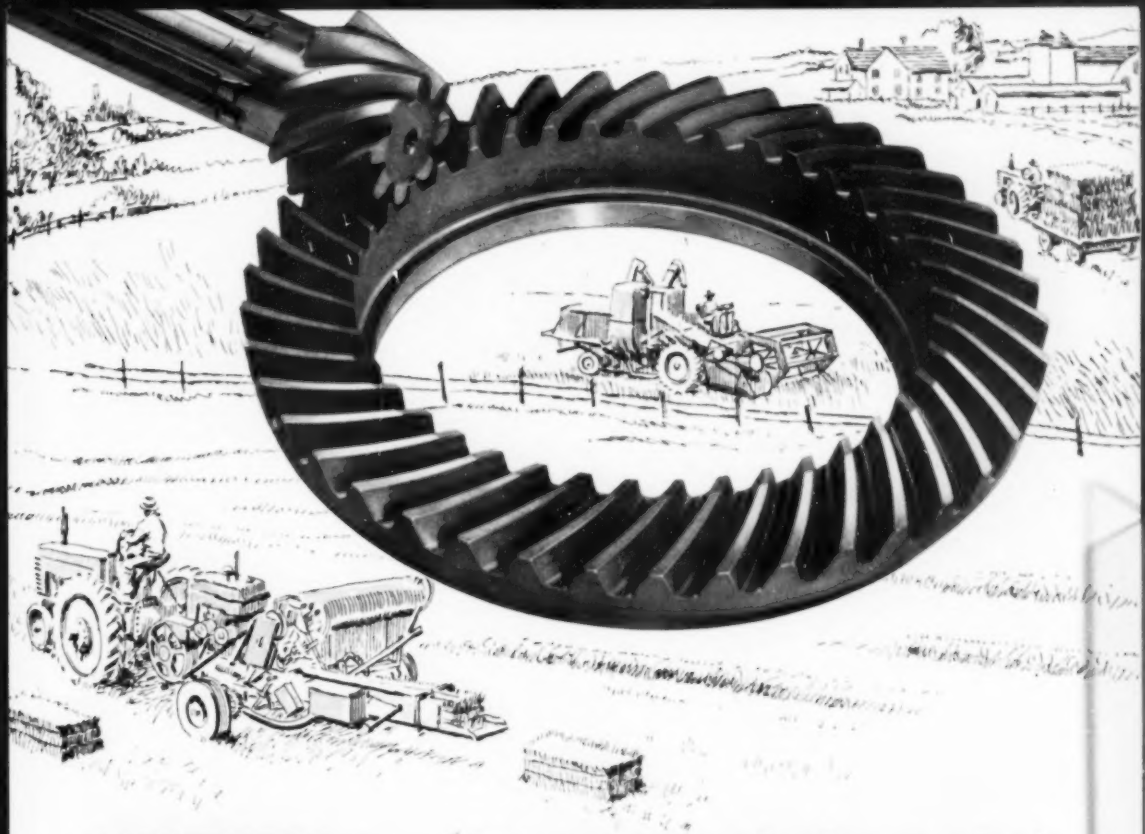


AGRICULTURE—geared to modern production standards

A self-propelled combine, handled by one man, will work rings around the old-fashioned threshing crews of a few years ago. And a modern hay-baler does in a few hours, at a single operation, the tedious work that required days of work not long ago. That's modern production—just as efficient—just as important to the nation's good—as the miracles of America's great industries.

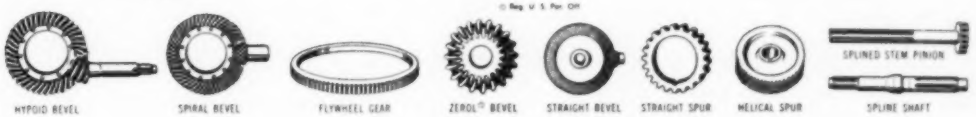
We're particularly aware of this development because "Double Diamond" Gears have grown up with the flourishing farm machinery business. For years "Double Diamonds" have been transmitting power in all kinds of mechanized farm equipment. As the machines grew bigger—as demands of them became more critical—"Double Diamond" Gears have grown in demand. They must stand unusual abuse—long periods of idleness followed by around-the-clock service months on end—and must deliver dependable performance at points many miles from service centers. The fact that "Double Diamonds" have met these requirements, and for so many years, makes them a name to bear in mind when your needs call for gears of that character.

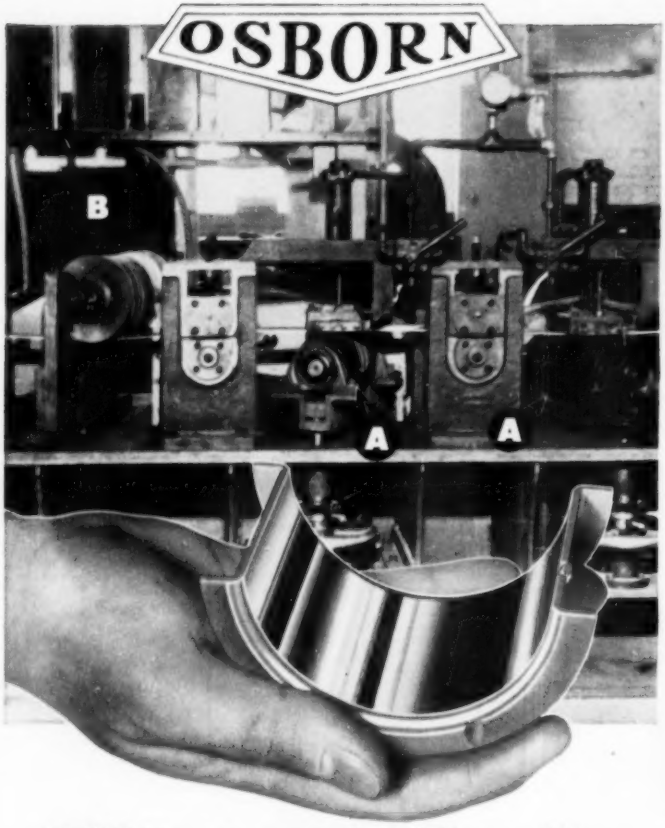
DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS





Will "automatic" ideas like these cut your costs?

THIS machine does two jobs at one time . . . does them thoroughly by power brushing . . . at the push of a button.

Perhaps a similar brushing method can help cut *your* costs, boost *your* production and improve the quality of *your* products.

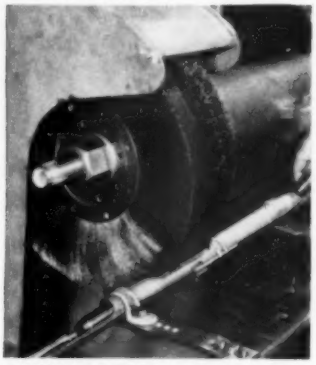
The machine developed with the help of the **O**sborn **B**rushing **A**nalyst cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master® Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch® Sections (B) then thoroughly clean the babbitt side.

This is typical of the cooperation which your **O**sborn **B**rushing **A**nalyst can give *you* to solve problems of product cleaning, burr removal, roughing, polishing and finishing. For help, call or write *The Osborn Manufacturing Company, Dept. 651, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

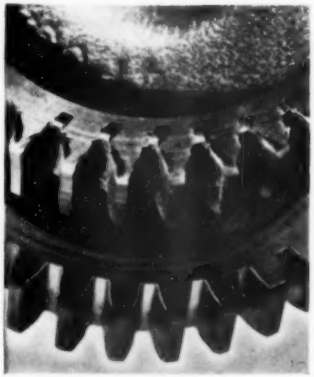
Osborn Brushes®

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

SAVES 12 MEN. This is one station of a five-station rotary automatic machine equipped with Osborn power brushes that removes burrs and sharp corners of clutch disc teeth. Formerly done by hand. Saves 12 skilled men.



9 TIMES AS FAST. This simple pipe fixture provides the means of cleaning threads of set screws. Can be applied to many cylindrical parts. Time was cut from 18 seconds to 2 seconds with this Osborn brushing idea.



10 TIMES AS FAST. This shows two gears before and after deburring by a new Osborn power brushing method. Note smooth uniform results. Time was cut from 3 minutes to 18 seconds.

pective hand comes in for his initial interview, a card from his former employer stating that he is unattached and available would be a very good opening for me to begin bargaining. And if there were some recommendations about his capabilities, it would help in placing him in the right spot. I have always been against the practice of coercing anyone to do anything. It will not make for good friends and will create a distrust in the man you hire. If you make it a practice to cheat your opposition, why won't you cheat those around you? Keep everything above-board and from past experience I know the results will be worth while.

Jack Bell

Bakersfield, Calif.

•

SOUR NOTE

As soon as financial matters enter into the picture between a worker and his foreman, you can depend upon it that trouble is in the making. There is no reason why sound friendship shouldn't exist between a man and his boss, but when the worker takes advantage of that friendship by making a 'touch' or, what is worse, by asking the foreman to sign his note the ending of that friendship is just around the corner.

Needless to say, the foreman is placed in a very embarrassing position when approached with such a proposition and will, ordinarily, sign in order to keep the person's good will and hope that the party will not let him down. I know of one boss who was decidedly an individualist. When one of the fellows asked him to back him up on a loan he wanted to make he came out point blank: "Heck no. Why should I sign your note and not sign everybody else's in the shop? I'm not running a bank." The man was right. There is no difficulty in borrowing money these days if one is in need of it, so why load up a fore-

The day you threw a tomato at the other apprentice—and hit the master mechanic—by mistake

Don't Let Gear Worries Spoil Your Sleep

When you require gears having either very close or wide tolerances, consult Vinco. Their "Metalworking Wisdom" is your assurance that all gears will be delivered as specified, and generally at lower cost.

• • •

Vinco mass produces parts and assemblies; is the source for gears, splines, engineering and designing.

A few of the close tolerance, turbo jet gears ground by Vinco.

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A wide selection of models and variable speeds meet requirements for shop arrangement and dependable performance when you use . . .

Strand
FLEXIBLE SHAFTS

Flexible Shaft Equipment

There is a Strand flexible shaft machine to meet practically every industrial need . . . floor models, bench models, overhead models, variable speeds and power. This is quality equipment that stands up under hard usage . . . the kind you select because of dependability.

Review the models shown here, then write for catalog and full information.

FLOOR MODEL—the floor-mounted flexible shaft machine is one of the most popular. It can be moved from place to place. Amply powered, the stand is out of the way while the head is light and easy to work with. Model shown is three-speed mounted on swivel yoke adjustable floor type tripod. Available in ⅓ H. P. to 1½ H. P., inclusive.

BENCH MODEL—here is convenient flexible shaft equipment that can be mounted on bench right near the work. Portable to the extent that it can be taken from place to place. For steady, fast production, consider the bench-mounted flexible shaft machine as part of your production setup. Model shown is three-speed mounted on swivel type adjustable bench column. Available in ⅓ H. P.

OVERHEAD MODEL—for production line work, overhead-mounted flexible shaft machines are a real convenience. Motor and mechanism are out of the way and flexible shaft conveniently located. To meet your requirements, review all models of STRAND flexible shaft machines. Model shown is three-speed vertical type for overhead mounting . . . it is available in ⅓ H. P. to 1½ H. P., inclusive.

A complete selection to meet every need!

EASTERN SALES
Woodberry, Baltimore 11, Maryland

The Balmar Corporation
N. A. STRAND DIVISION

WESTERN SALES
5001 North Wolcott Ave., Chicago 40, Illinois

man's shoulder? If the foreman volunteers to assume the responsibility, that is another matter.

These days, things like this are handled through the welfare department of the plant. One individual does not have to shoulder all the responsibility. I know of one executive who not only handed out money right and left to one of his men to help him out of his troubles but paid out a couple of hundred bucks to bail him out of jail when his wife shoved him in the cooling chamber for some reason or another. I wouldn't blame that executive if he has since lost all confidence in human nature, because he was eventually left holding the sack.

John Homewood
Ontario, Calif.

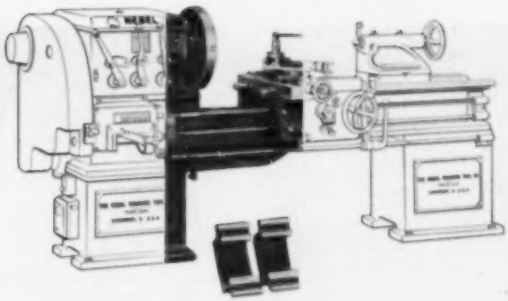
•

TO EACH HIS OWN

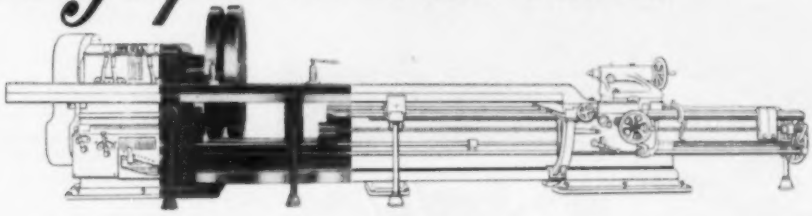
CAN JOBS be successfully split by degree of skill? Most jobs can, and in the wider sense, most jobs are. Who, for example, would think of asking a lathe machinist to rough and finish a lathe job, then proceed to grind and perhaps to lap it, too? We support the practice of "splitting" every day of our production lives by employing lathe machinists, milling, drilling, planer, grinding machinists, etc.

To subdivide any one of those occupations into roughing and finishing operations is but to introduce further refinement and to grade operators more intensively according to the degree of skill and proficiency which they possess. In Britain, marking off is regarded as a fitter's job, but few shops with a considerable volume of fitting and erecting work to do would agree to each fitter marking off his own work. Not every fitter makes a successful marker-off, so here we see again the subdivision of skill at work in the interests of rapid and economical production, not the least of the savings accruing from this particular "split-up" being greater freedom from spoilage. A highly skilled man constantly employed on marking off becomes speedy, accurate and dependable, three very excellent production characteristics which can make and save a lot of money to the company concerned.

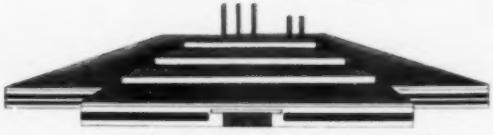
Al's idea is sound common sense and excellent practice from the point of view of economical production and low maintenance costs. If intelligently and continuously applied, it can also show savings in the matter of capital expenditures. Much depends, of course, on the quality of finish and accuracy demanded.



the gaps in our line



fill a need in



your plant!

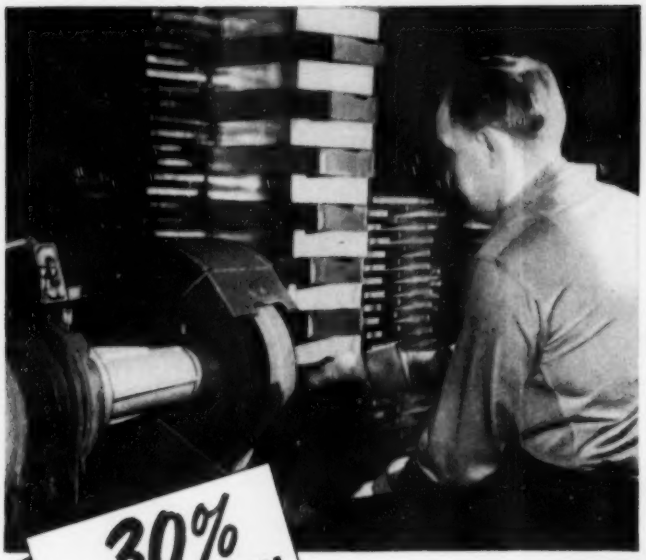
If you have a variety of big, bulky, odd-shaped pieces to turn regularly, you need a Nebel gap lathe. Either a removable block gap or an extension bed gap. Depends on your individual requirements. Your Nebel distributor, located conveniently close to you, will be glad to help you decide which is better. Why not phone him now?

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

fine lathes at modest cost since 1899 . . .

write for free bulletins!

Nebel



30% PRODUCTION SAVINGS... with Jewel Brand Coated Abrasives!

BY SWITCHING TO JEWEL BRAND resin bonded abrasive belts, a manufacturer of cold rolled steel boxes for tools, first aid kits, electronic parts and similar equipment, made production savings of 30% in removing welding beads.

SAVINGS LIKE THESE are possible because properly chosen Jewel Brand Belts cut faster, last longer. And all Jewel Brand Coated Abrasive Belts have the exclusive *Velvet Joint* that eliminates bumping, adds many hours of productivity.

HELP YOURSELF TO SIMILAR SAVINGS by making the simple Waste Barrel Test. Send us a letter size sample (preferably including the joint) of a used belt taken from your waste barrel. In most cases, Jewel Brand Engineers can recommend a Jewel Brand Coated Abrasive Belt that will save time and money for you! No obligation of any kind.

Fill in coupon and send with used belt sample.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Mass.

Sure, we want to cut production costs! Enclosed is sample of used belt from our plant.

NAME .....

POSITION .....

COMPANY .....

TYPE OF PRODUCT ..... MATERIAL .....

WE USE APPROXIMATELY ..... BELTS PER MONTH .....

BELT LENGTH ..... BELT WIDTH .....

While Al refers to his work as being rougher than Ed's tool job, he does not say that his work is *rough* work. Whenever possible, it is always good practice to set aside certain machines to take care of the hogging operations, thereby preserving the accuracy of the better and more modern plant. This is not an appeal for retaining and operating plant which should be in the scrap heap; it is an appeal for the intelligent grading of plant, just as one grades men. The less accurate, though not necessarily slow, machines can be profitably employed on roughing operations and, as Al contends, they can be satisfactorily manned by operators whose degree of skill would rule them out where high finish and accuracy were called for. Three-jaw scroll chucks can save a great deal of setup time, even on variety work, but it is widely recognized that they soon lose their accuracy if they are used to grip on rough, irregular surfaces. I have always insisted that scroll chucks, when new and accurate, be used only for finishing operations after the work has been machined on the roughers. In this way, the life and accuracy of the chuck is preserved, capital expenditure curtailed and the quality and accuracy of the finished product maintained. Even with intelligent handling, the high accuracy of the scroll chuck cannot be preserved indefinitely.

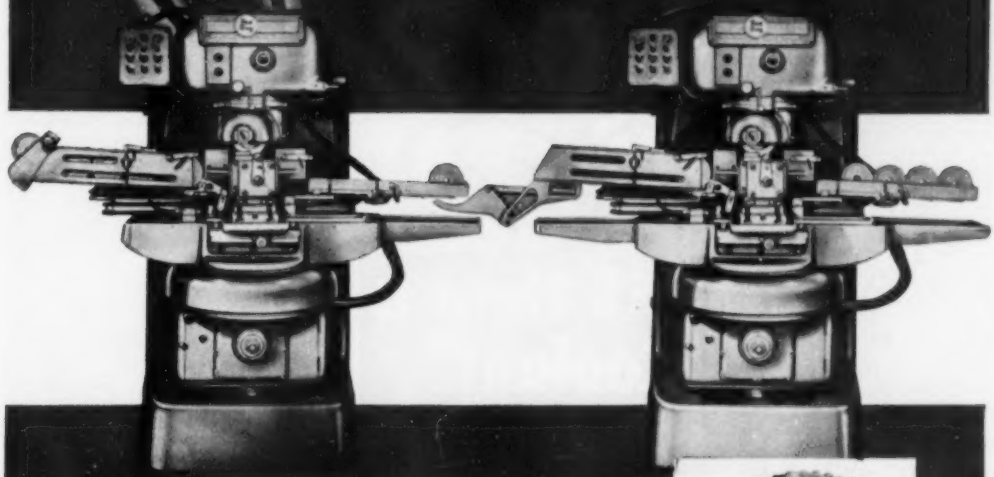
When it falls below the required standard the time has arrived to pass it on to the roughers where many years of useful productive work awaits it. I calculate that with careful handling, the life of a scroll chuck on finishing operations can be trebled, with a corresponding fall

"His wife works!"

RED RING Straight Line Automatic Loader

Saves Time and Conserves Manpower

In Shaving Cluster Gears



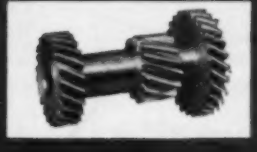
This new Red Ring Loader puts the shaving of cluster gears on a continuous automatic basis with important savings in time and manpower.

Although the illustration shows a battery for shaving a two step cluster, additional machine units may be added for as many additional steps as necessary.

All machines in such a battery are synchronized, but each unit is individually controlled and may be individually operated when desired. Each incorporates the universally accepted crossed axes principle of shaving.

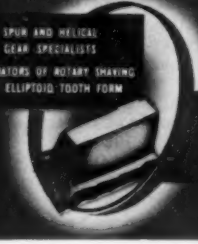
A single operator is needed merely to supply unshaved gears to the magazine feed of the first machine and to remove the completed gears from the discharge chute of the final machine. All handling between machines is done by the automatic mechanical transfer mechanisms. All operations are in full view of the operator at all times.

Write for full description and savings.



SPUR AND HELICAL GEAR SPECIALISTS

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM



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5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

MORE than a "Coolant" is needed

"COOLANT" is a misnomer as applied to *cutting fluids*. You won't get far with just a coolant. The fluid used for metal cutting must have multiple characteristics in order to provide the desired finish and tool life at the required production rate:

- **Cooling Action** — very necessary to carry away the heat generated by machining, but only part of the function.
- **Lubricity** — to reduce friction between the tool point and the work piece. The lubricating qualities of the cutting fluid make a big difference.
- **Anti-Weld Properties** — to prevent build-up of metal on the tool and scuffing of the work piece. The amount of anti-weld agent in the fluid is a critical factor and depends on the job.

These factors and others are all inter-related. Over-simplification of the subject and the cutting fluid can lead to trouble. Let a Stuart sales-engineer show you what can be accomplished with the *right* cutting fluid.

Ask for Bulletin

Get the Facts
Visit the
STUART BOOTH
No. 1823
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ASTE SHOW
Chicago, Mar. 17-21

D. A. Stuart Oil Co.

2729 S. Troy Street, Chicago 23, Ill.

TIME-TESTED
Cutting Fluids and Lubricants

in capital expenditure on that particular tool.

The foregoing applies with equal force to machines and operators. It is folly indeed to employ an accurate production machine on roughing operations; it is folly and cruelty to employ a highly skilled operator on such work, besides making the worst possible use of the company's dividend potential.

A short term of roughing would certainly not be unfair to apprentices, say, the first 18 months. There is much for them to learn during their apprenticeship besides accuracy and finish. Setting up, depth of cut, correct grind of tools, cutting life of tools between grinds, care of tools, care of the machine, to cite a few, all make excellent training for the embryo craftsman. I would regard 18 months as the maximum period for such training. To extend it, more especially in the case of intelligent, ambitious youth, would savor of profiteering or exploitation on the part of the employer.

C. D. Mackinnon
Airdrie, Scotland

•

ALIAS JOHN SMITH

WHAT's in a name? Does it matter if a Hester was born a Morrison or if John Jones is alias John Smith? I believe that as long as a man has broken no law, his past and identity are his own business. His name is no index of his character, capability or competency.

However, from the personnel department's standpoint, an assumed identity requires rectification. Although a worker, in seeking to hide his past and identity through assumption of an alias, may have been innocent of any serious ulterior motive, the best course for the foreman to follow is to bring the matter to the attention of the personnel department. That department is responsible for passing on the skill, capability, and character of the applicant for employment. It also bears the responsibility for following up the selected worker for evaluation of his competency.

As the mission of the personnel department is to take work off the shoulders of the foreman, I believe that the question of what to do about the assumed identity of a worker should be left to the decision of that department. Let them decide whether the facts in the case warrant action.

Although the man may claim to have offended no law but believed the assumption of an alias would

No Gear Problems for me...

I just turn them over to

Yes, you can "rest assured" when you order from Philadelphia. For 60 years, we have been supplying every line of industry with gears of all types, sizes and materials. In that time we have encountered and found solutions to almost every kind of gear problem. This specialized experience plus our modern gear making methods and machines can be the answer you have been looking for.

Whether you need one gear or a hundred you'll get satisfaction and service by ordering from Philadelphia. A copy of our gear catalog #48 is a helpful guide for gear buyers. Write for it on your business letterhead.

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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

How you SAVE ON HOIST MAINTENANCE WITH COFFING

...Quik-Lifts

Here are just a few of the "extras" that keep Coffing Quik-Lift electric hoists on the job, save maintenance:

- Gears are drop-forged alloy steel, hard-faced for extra wear, soft-cored for added strength. Teeth are larger, stronger.
- Moving parts run on lubri-sealed ball bearings.
- Pendant rope controls are used for more dependable and trouble-free service over the years.
- Load-holding parts are tested at 100 percent overload.

Quik-Lift electric hoists available in 17 models, 500- to 4,000-lb. capacities.

...Challengers

Coffing Challenger spur-gear hoists are completely new throughout...with new lightness, new strength, new design simplicity:

- Housing is formed steel plate—withstands shock loads and rough handling.
- Laminated steel back plate gives extra support to hoist mechanism.
- Has five-to-one safety factor, tested at 100 percent overload.
- Gears and bearings have lifetime lubrication.
- The Challenger has only 29 basic parts—simplest spur-gear hoist ever made.
- May be completely disassembled in minutes with ordinary tools.

Challengers and other Coffing spur-gear hoists in capacities from ½ to 5 ton.

Test these points yourself. Pick out the toughest hoist job you have, install the right Coffing electric or spur-gear hoist—then see how little maintenance is required, how they *stay on the job.* For further information on Quik-Lifts and Challengers, write Dept. AM-3.

COFFING HOIST COMPANY

Danville, Illinois

HOIST-ALLS • SAFETY-PULL RATCHET LEVER HOISTS • MIGHTY-MIDGET PULLERS
DIFFERENTIAL CHAIN-HOISTS • LOAD BINDERS • I-BEAM TROLLEYS

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ease his marital entanglement, it is not up to the foreman to keep the man's confidence. Any information of this nature should be turned over to the personnel department for evaluation in connection with the worker's moral worth to the company. If investigation develops the facts that the man is not afoul of the law and his past actions will not affect his worth as an employee, then no one stands to suffer by one man's mistake. Why should the foreman take the chance of withholding pertinent information raising doubt and reflection on the character and worth of one of his workers? In self protection, he is justified in bringing the matter to the proper authority for clarification and decision.

The separation of a man's personal life and business is difficult because they are interrelated. The employee's private life concerns the company. Where there is a reasonable doubt as to the moral fitness of an employee, the Personnel Department should be apprised of the facts and make it its duty to investigate the situation. This investigation and subsequent employee-counseling and guidance may clear up the unsatisfactory condition and improve the peace of mind of a trained employee, with the end result of a better worker.

Harry Kaufman
Philadelphia, Pa.

•

THIS IS a very difficult problem, and all shop executives will readily appreciate Al's and Ed's disagreement on the matter. So many important factors govern the situation. We all know, of course, that a man may never transgress the criminal law and yet be a thorough scoundrel. It all depends on his cunning, his cleverness, and how much rubber he carries in his neck.

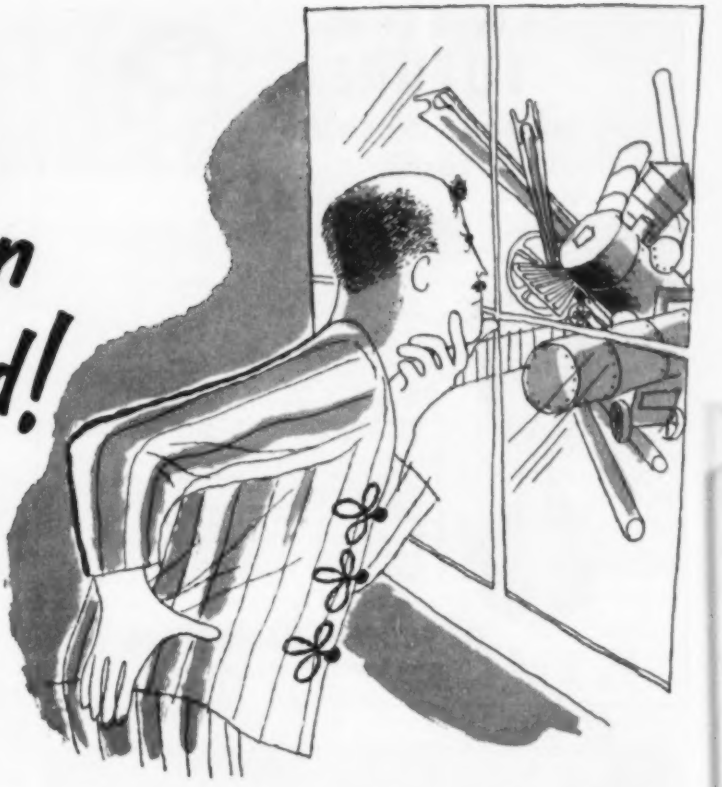
In the broad sense, a man's past and his identity are his own but when he accepts employment from another, they are then not exclusively his own. It then becomes necessary for others to know something of both his past and his identity.

In Britain, we are all provided with identity cards which are regarded as our passport in every circumstance in which we may find ourselves. It takes a good deal of ingenuity to wriggle out of that and it certainly cannot be done without offending the law. A man's past is a man's character, and in more normal times a character, or reference, often decided the issue of employment or unemployment.

That is why I hold that when a

Look in your own backyard!

Vital scrap lies in the oddest places . . . a morning's search can be a needed help.



Scrap is where you find it. Maybe not within the view of your boudoir window. But have you made a real check of your plant premises?

Frankly, all of us suffer from the same inertia and bad habits. We saw the papers and read of the constant cry for steel. We even read ads like these —made an instant promise to do something about it—and with our collective red face—forgot it.

But how about changing all that? How about this very morning—today at the very latest—joining us in a thorough search of the premises . . . and digging out that crumbling pile of iron oxide . . . the stuff you know you never will use in a thousand years . . . and get it on the way to the melting mills.

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man seeks or accepts employment, his past, especially, is not exclusively his own because his prospective employer will want to know something about it. When we ask for a reference, we are really asking for some record of a man's past.

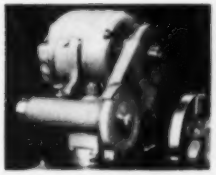
Should a foreman keep a man's confidences? The answer to that one is conditioned by what the confidence reveals. Personally, I feel that the less an executive knows about his men's intimate private affairs, the better for both. This should not be taken to mean that the boss should take no interest in the men's personal affairs, but that such an interest should be wholly general in character. A surface knowledge of the men's home life is all that the executive needs to enable him to make some passing, friendly reference, usually quite appreciated by the average man.

Human nature is so baffling and incomprehensible that a man might easily be a poor fish morally, a cheat or a hypocrite, yet may have committed no criminal act and may be a first-class worker and tradesman. I have had men with me whom, because of their moral records, I wouldn't have touched with a barge pole; yet, because of the correctness of their conduct in the shop and their undoubted skill and productive ability, I was compelled to class them as industrial assets. After all, they were employed to deliver the goods and so long as they did that and did not trangress the shop code I did not feel I was taking a chance, although I did not like them as men.

Al only became aware of Morrison's secret by accident, and, all things considered, it would be just as well he should turn a blind eye on it.

With only one side of the story, neither Al nor Ed are in a position to judge fairly and I don't think industrial executives should be expected

The day you were in too much of a hurry to change the chuck jaws—and the file got caught—°°!



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Milling Attachment

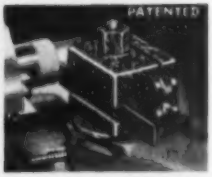
Handlever Tailstock

Handlever Bed Turret

Telescopic Taper Attachment

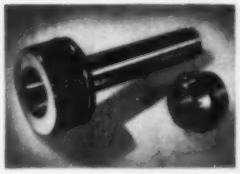
Handwheel Collet Attachment

Handlever Collet Attachment

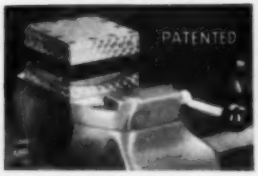


10 in 1 Tool Holder

Ball Bearing Live Center

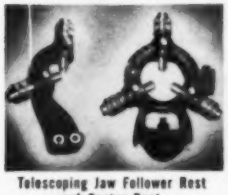


Adjustable Collet Bushing Chuck



Square Turret Tool Block

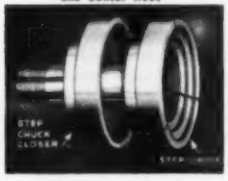
Handlever Double Tool Cross Slide



Telescoping Jaw Follower Rest and Center Rest

Collet Rack

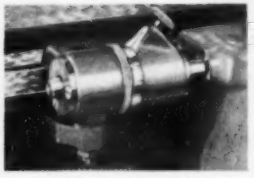
Steel and Brass Collets



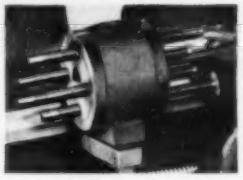
Step Chucks and Closers

Centers and Drill Pads

Thread Dial Indicator



Micrometer Carriage Stop



Four Position Carriage Stop

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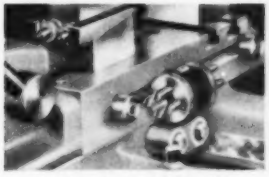
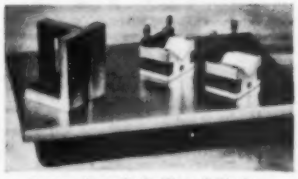


Four Position Cross Slide Stop

Safety and Standard Lathe Dogs

Coolant Pump



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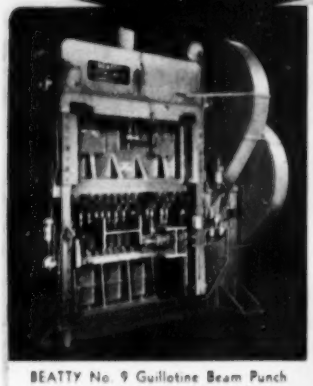
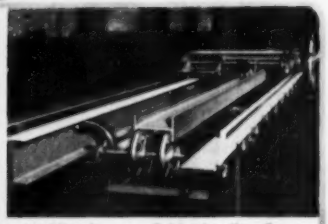
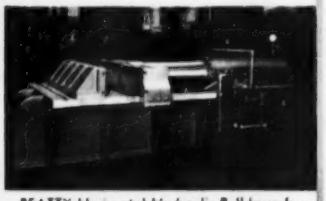


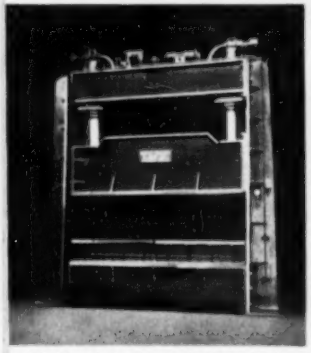
BEATTY No. 9 Guillotine Beam Punch for flange and web punching of beams up to 30"



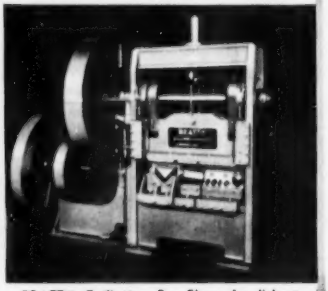
BEATTY Spacing Table handles flange and web punching of beams without roll adjustment.



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging and bending.



BEATTY 400-ton Hydraulic Vertical Bulldozer for heavy forming and pressing



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to be judges of family affairs. We do not ask if our banker, our baker, our candlestick maker are good family men and play the game by their wives before we do business with them. Very few men, I imagine, would think of inquiring into an employers' past before accepting employment with him.

It is always good business to attract men of acceptable character to the workshops. In more selective times, that practice was regarded almost as a condition of engagement but, alas, we are not living in selective times, thanks to a super-abundance of work and an acute shortage of labor. This shortage compels us, here in Britain, to welcome to the shops, types who in happier times would not have been considered; today, employers are prepared to engage the least objectionable and take a chance.

C. D. Mackinnon
Lanarkshire, Scotland

•

LITTLE PITCHERS, BIG EARS

WHAT CAN Al do to straighten out the situation without involving his son? It is unthinkable that Al should further involved his son in the matter, might well point out to the lad that it was wrong of him to listen to conversation not addressed to him and very wrong to repeat what he had overheard, even if he could not help being a listener. I think Al's view is the correct one here.

If Tom has a grievance, or thinks he has, it won't right itself without him doing something about it. If he really thinks Al is treating him unfairly, surely the logical thing to do is to explain his fears to Al and not to sulk like a child. A short get-together would probably clear the matter up for him and, consequently, for Al.

In those democratic times, clearing up a misunderstanding with a foreman or manager should not prove to be a matter of difficulty. If agreement be not reached, appeal to a higher executive would be a mere matter of procedure. It is so obviously a matter of importance to Tom and his foreman that the unpleasantness be replaced with good feeling and understanding that I marvel at Ed advising Al against that common sense course.

At the same time, Al is not free from blame. If we examine his own observations on the matter we must conclude that at one time Tom stood high in Al's estimation—"Something's happening to him"—"He's getting moody and temperamental"

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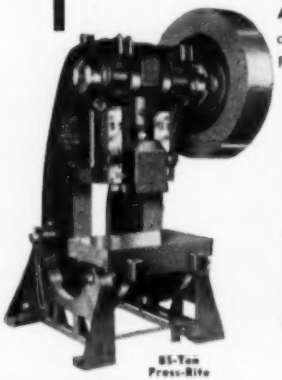

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—"His work is beginning to show it" "He's slowing up"—. All those pregnant observations of Al's indicate that, quite recently, Tom was an asset rather than the liability he would now seem to have become. "His work is beginning to show it". "Beginning," in this instance, is truly eloquent; it should also be an invitation to Al.

The beginning of everything should be carefully watched, more if the thing is trouble, no good waiting until Tom is throughly disgruntled. In this case Al should strike while the iron's just heating, not when it's hot—that might be too late. Noting the deterioration in Tom's work and manner, Al need not have waited for his youthful son's second-hand account of Tom's grouse against him. On this occasion, Al would seem to have nodded and I am left with the conviction that the Tom-Al trouble is due to the cause of most misunderstandings between two people: faults on both sides.

It is always much easier for the boss to make the first advance in clearing up unpleasantness between himself and another employee in his charge. In the best interest of the company it is, in fact, a duty and need not be an unpleasant one if the foreman has a clear conscience in the matter and a good method of approach. If the foreman's conscience is not easy on the matter, the more reason why he should make the first move.

C. D. Mackinnon
Lanarkshire, Scotland

NEW BOOKS

POWDER METALLURGY, *Vol 9, Selected Government Research Reports—Published by Her Majesty's Stationery Office. Available from Sales Section, British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. Price $4.25 postpaid*

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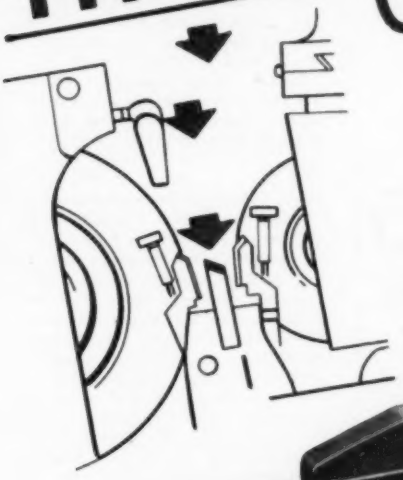

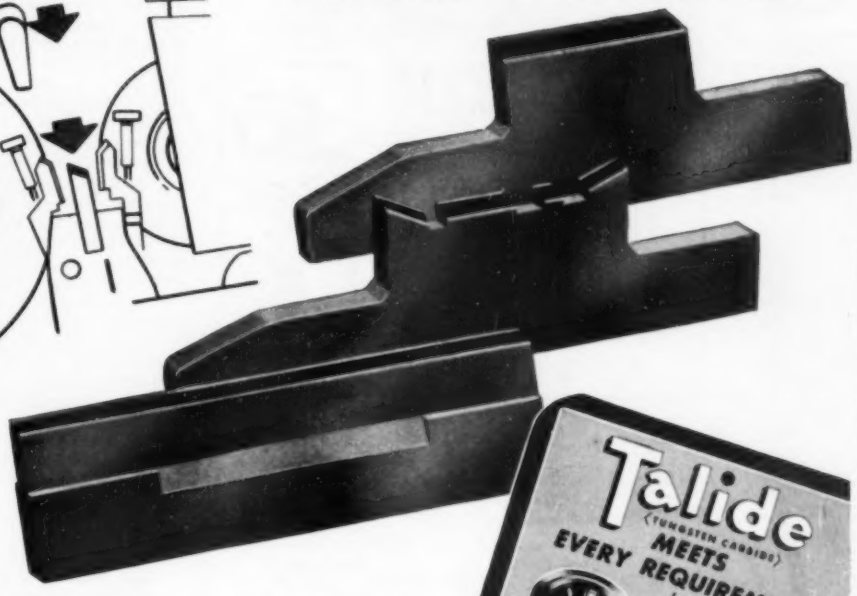

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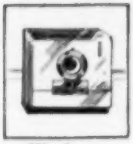

Washers

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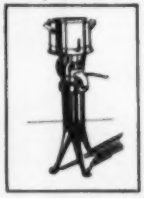

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microstructures of various sintered metal components is also described. Among these parts are gears, iron driving bands, splined bushings, bearings, and pole-pieces. Clutch plates and brake-linings made of a complex mixture of copper, lead, tin, iron, graphite, and silica are said to have a working life ten times that of the usual asbestos material.

Included in the book is a survey of the production and development of metal powders and sintered components in Germany during WW II.

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TOOL STEEL HANDBOOK—*Published by Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa. 197 pages. Free to qualified persons upon request.* Intended for engineers, teachers, metallurgists, and others interested in tool and die steels, the reference manual covers properties, analysis, and applications of tool steels by means of tabular data. Detailed descriptions of tool steels are included to cover forms and finishes, heat-treating and handling techniques, and conventional practices regarding ordering of steels. HSS, hot-worked, shock-resisting, cold-worked, and carbon steels are included. Material for the book was drawn from Allegheny Ludlum and many of its customer companies.

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PRACTIAL INDUSTRIAL ELECTRONICS—*By Fred A. Annett, Associate Editor, Power. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 381 pages. 381 illustrations. Price $5.50.*

This material was originally published in *Power* magazine, in serial form, for industrial readers. Therefore, it is directed primarily toward shop applications of electronics; machine power, control mechanisms, delay circuits, signalling devices, indicators, and the like. As the author justifiably states, it tells in easy lessons what electronics are, how tubes work, and how they are applied.

Without going too deeply into the intricate technicalities of electron-tube operation and circurity, the author covers a lot of ground in language that is not over the heads of ordinary shop personnel; yet is adequate to describe the things electronic can do. This is a feature that might well be applied to many other technical books and operating manuals.

As a primary introduction to elec-

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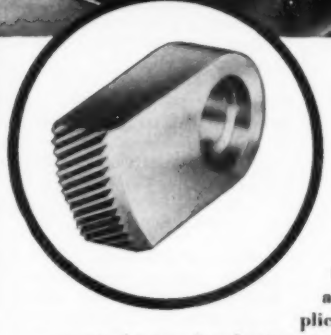

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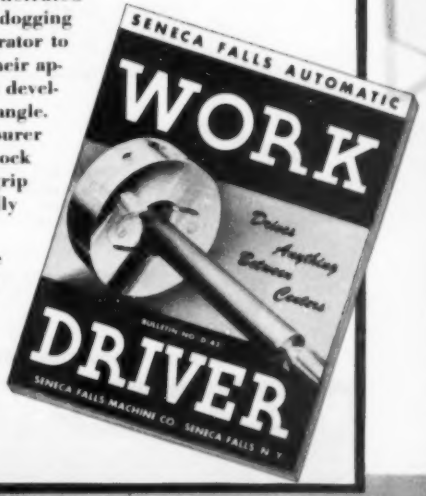
● These self-centering, quick-acting Drivers have long demonstrated their ability to eliminate dogging time and to enable one operator to attend multiple machines. Their application has been widened with development of a new jaw having serrations milled at a suitable angle. These angular serrations provide an overlapping contact for surer and quicker grip on smooth finished, as well as hot rolled stock and forgings having a relatively hard surface. This positive grip eliminates slippage and resultant tool breakage . . . especially important when costly carbide tools are used.

Seneca Falls Work Drivers are designed for use on any engine or multiple-tool lathe and for certain work on turret lathes and grinding machines. In addition to time-saving, the Seneca Falls Automatic Work Driver provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. Made in 18 standardized models for work diameters ranging from ¼ to 6⅞ inches. Write for Bulletin D-43.



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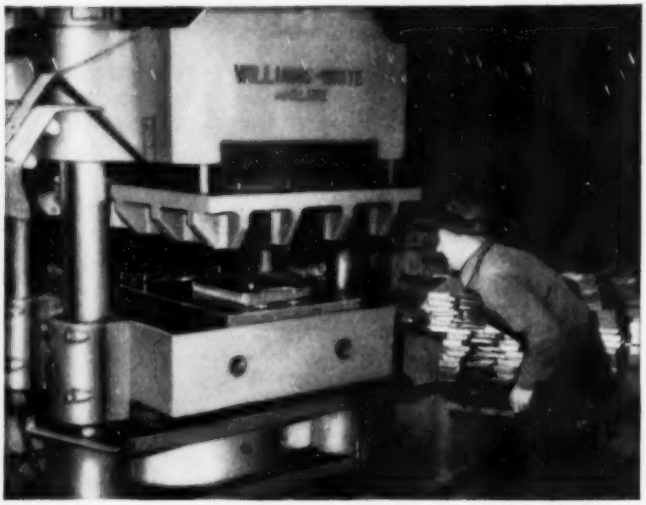

WILLIAMS-WHITE 600-Ton Hydraulic Press forming broiler pan racks for electric ranges. Inexpensive, lightweight and quickly made Masonite dies are used as forming blocks to make possible short runs or quick changes in design.

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MAKERS OF QUALITY PRODUCTION TOOLS FOR NEARLY 100 YEARS

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tronic applications in industry, and as a background for further electronic education, the book does a good job. Frequent analogies to hydraulic circuits that do work similar to electronic circuits help the reader understand what goes on. Though electronic engineers often dislike such comparisons, they are educational; which, after all, is the function of a book.

For the prospective reader: Chapter headings mention the electron, photoelectric tubes, reactors and capacitors, rectifiers, relays, amplifiers, oscillators, recorders, safeguards, controls, and motors, among others.

•

FBI REGISTER OF BRITISH MANUFACTURERS. 1951/52 (24TH EDITION) *Published by Kelly's Directories Ltd and Iliffe & Sons Ltd, Dorset House, Stamford St., London S.E. 1, England. 822 pages. Price 42 shillings.*

This directory of British manufacturers is classified for quick reference in English, French, and Spanish, and is designed to promote Britain's export trade. It is divided into seven sections, inculding a buyer's guide listing over 6000 FBI member firms, an alphabetical directory of all member firms, a list of trade associations, brands and trade marks, and statistical information.

•

FINISHING MATERIALS AND METHODS —*By George A. Soderberg. Published by McKnight & McKnight Publishing Co., Market & Center Streets, Bloomington, Ill. 320 pages. Price $4.*

Every now and again a new book appears with a plain, unvarnished title, but with a content that is full of surprises. Such is this volume by Soderberg, Ass't Professor of Industrial Education, Stout Institute, Menomonie, Wis.

The book is divided into two sections; the first covers finishing materials, the second, finishing methods. Under materials, the various types of paints, lacquers, and varnishes are described, and information is given as to their invention, history and method of manufacture. Stains, bleaches, fillers, removers, flock, firm retardants, pearl essence, polishing abrasives, waxes and pressure-sensitive tapes, all are described. Each material has a short chapter to itself, and its purpose, and frequently its formulation is presented in simple language, together with information

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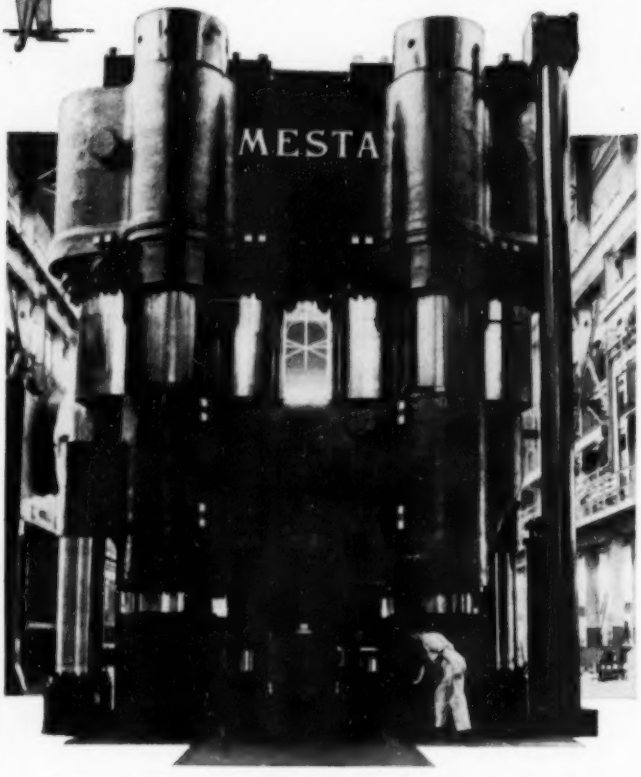
Tailor made **DIE LUBRICANT for the largest forging press in the land**



Largest forging press in U. S. A. — pressure 18,000 tons — is operated by Wyman-Gordon Company at North Grafton, Mass. in forging large light metal parts for the aircraft industry.

To lubricate the dies and to promote the flow of metal to fill the die completely, Wyman-Gordon uses ECONOMY Die Lubricant — one of a complete line of metalworking lubricants in which The White & Bagley Company has specialized since 1888.

There's an ECONOMY lubricant or coolant for every metalworking operation — "tailor-made" to do the job better, faster, more economically.

ECONOMY METALWORKING THE WBCo LUBRICANTS

For detailed information on ECONOMY Metalworking Lubricants — see SWEET'S FILE FOR THE MECHANICAL INDUSTRIES *Section* 4m WH *or write direct to us.*

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.
Originators of Grinding Lubricants

on how and also where to apply it.

The second section tells just how to proceed, and what tools are required for producing all kinds of finishes. How to bleach, how to fill, how to grain or marbleize; how to stain, how to stencil, how to flock, are but a few of the many informative chapters. How to tape and finish a dry wall, how to inlay a gunstock with silver, and even how to metallize baby shoes, are more of the interesting items to be found in this unusual book.

•

TOOL AND DIEMAKER APPRENTICE COURSE — *By Victor Wrasse, T & DM, Friden Calculating Machine Co, and T & DM Instructor at Laney Trade and Technical Inst, Oakland, Calif; Herbert Zechman, T & DM, Hubbard and Co, Emeryville, Calif; and John G. Robb, Plastics Engineer, American Molding Co, San Francisco. Publised by the Calif. State Department of Education, Bureau of Textbooks and Publications, Library-Courts Bldg, Sacramento 14, Calif. Price: Workbook $2, Testbook $2, Final Exam 15¢*

Under the direction of a State Educational Advisory Committee organized by the State Dept of Education and consisting of three labor union members and four industrial members, this course was prepared to meet a need indicated by labor and management.

Consisting of a workbook which contains six major units covering more than 50 technical topics, this new course should be valuable to any group operating, or contemplating, a training program in tool and diemaking. Subjects include: tools, jigs, and fixtures; gages; punch press dies; forging dies; die-casting dies; and dies for plastics. This course assumes that the apprentice has completed the machinist apprentice training course, hence none of the machining processes and equipment are covered. The committee recommends that only top-grade machinist apprentices be given the course.

The testbook contains an objective test for each of the topics in the workbook and the final exam indicates the quantity of know-how absorbed.

This material is also useful in extension courses for journeyman machinists and tool die makers who wish to improve their technical knowledge.

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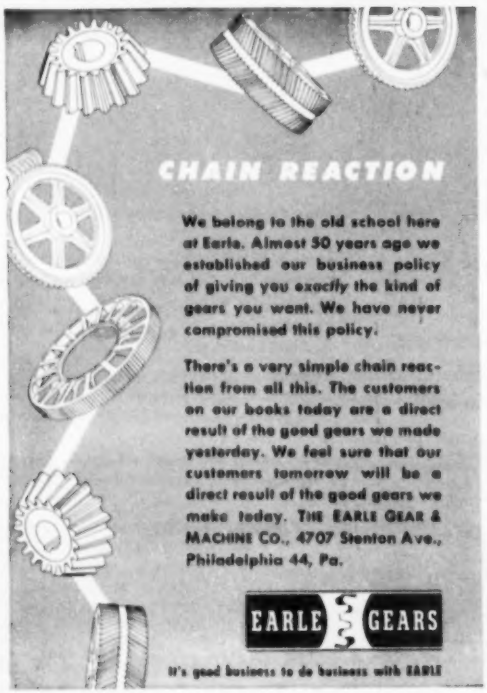
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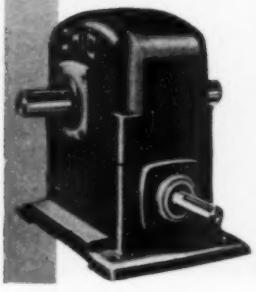

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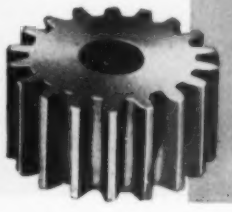

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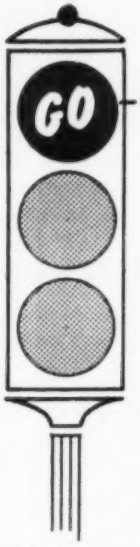

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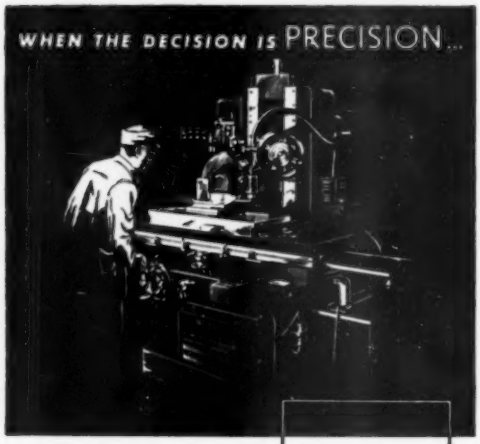

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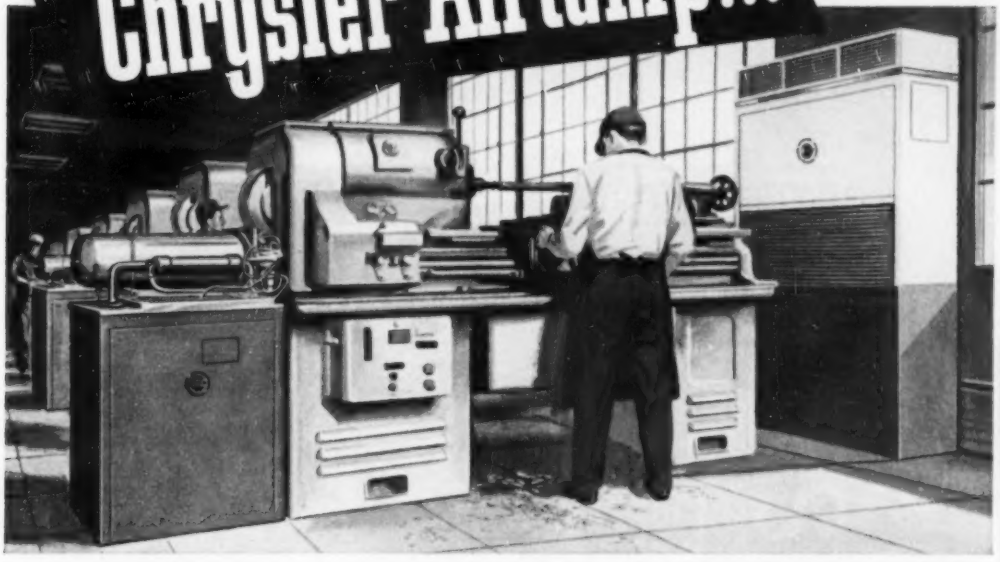

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There is a Henderson Machine to de-fraze the inside and outside ends of the tube and a Henderson press for Tube Manipulation.

Please write for full particulars or ask our technical representative to call.

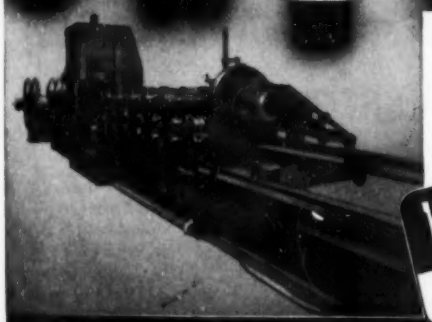

Illustration shows Henderson Electric Fusion Tube Mill. Electronic control of weld-heat is instant and stepless.

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A special cement (we supply it) binds the UNISORB pads to machine feet and floor with a holding strength of 1500 lbs. per sq. foot *minimum.*

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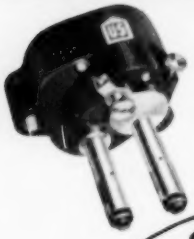

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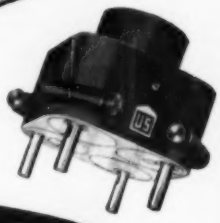

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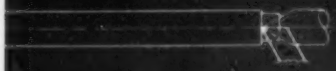

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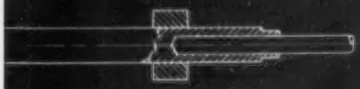

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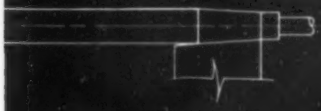

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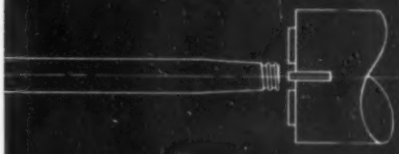

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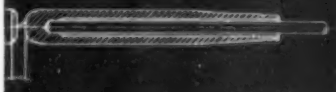

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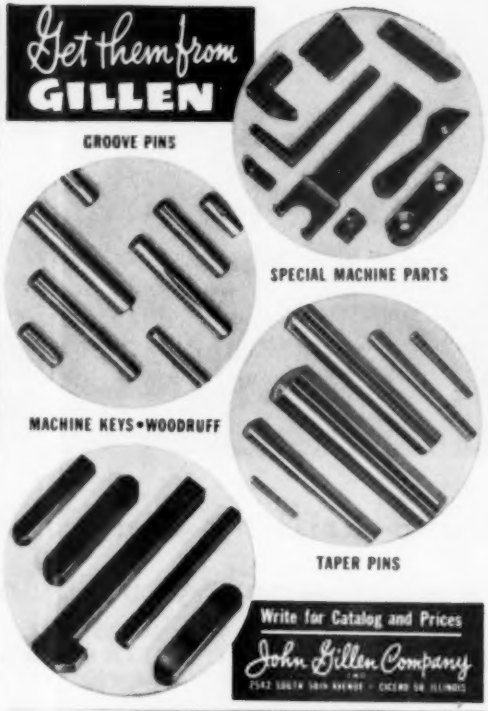

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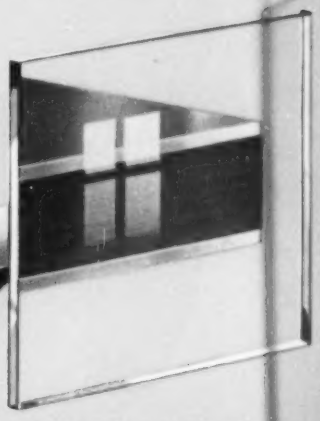

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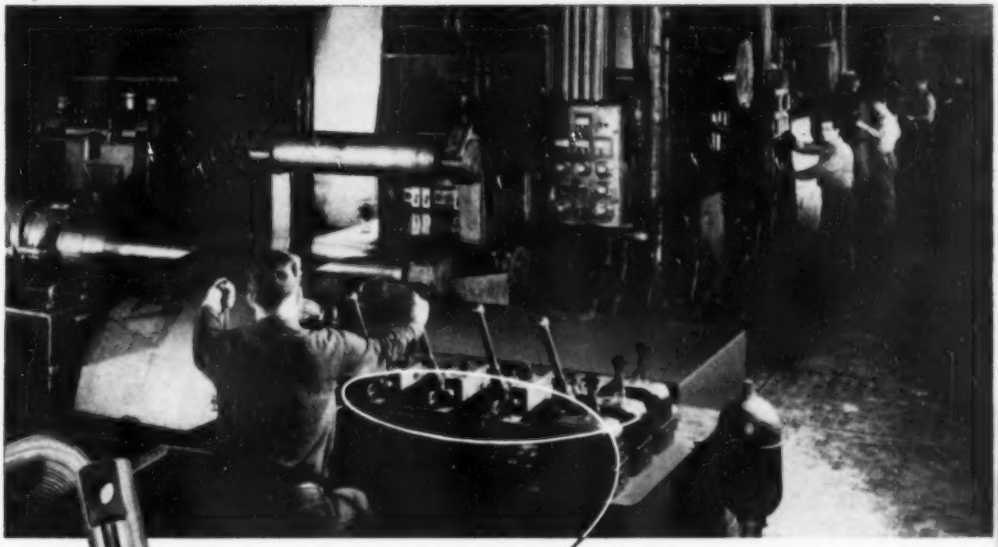

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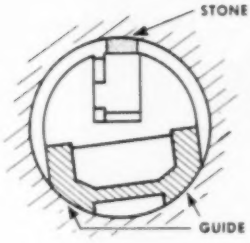

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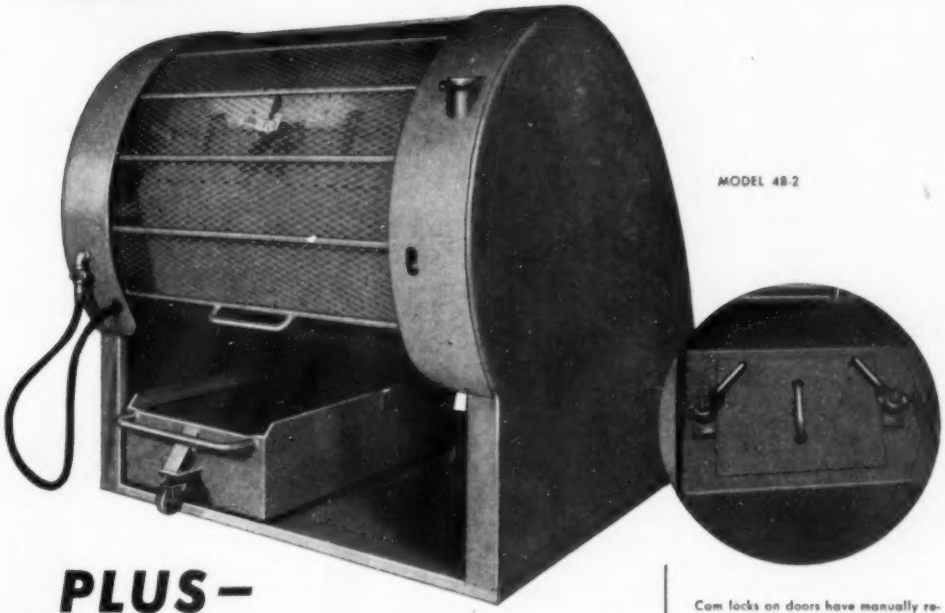

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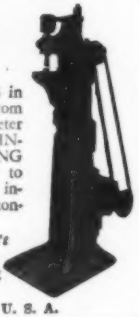

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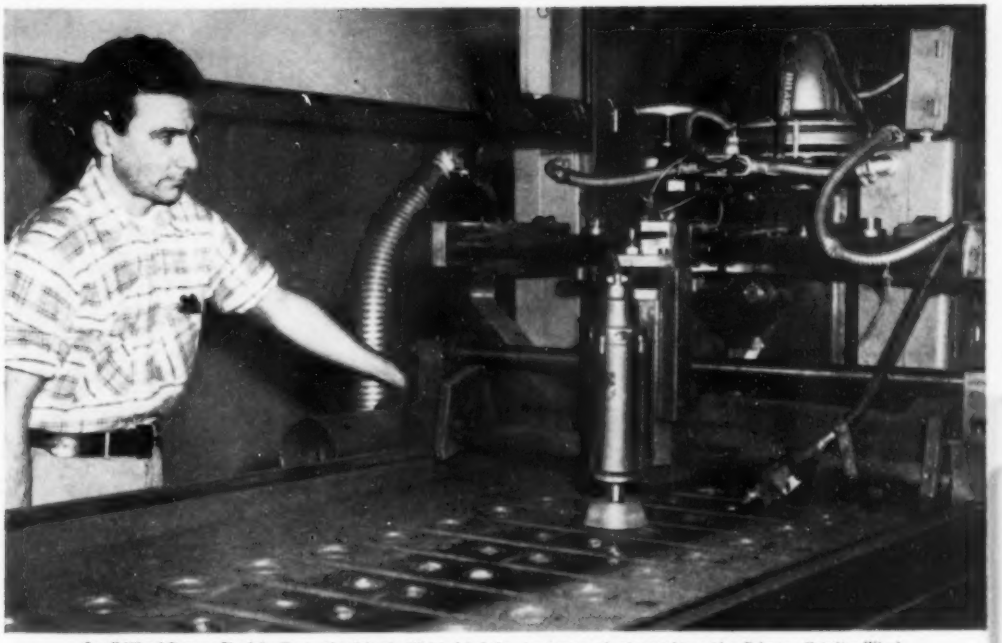
Pacific Coast Representative: *A. C. Berbringer, 336 N. San Pedro St., Los Angeles, California.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*



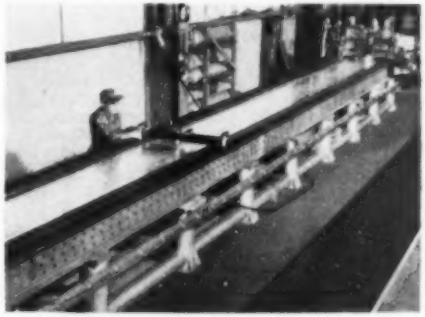
Small Wheel Does a Big Job. *Truing the 40 foot by 27½ inch bed of a wing spar cap shaping machine with a Robertson Grinding Wheel.*

ROBERTSON GRINDING WHEEL SOLVES A BIG PROBLEM FOR CHASE AIRCRAFT

It was an ingenious machine which Chase built for shaping wing spar caps for the C-123 Assault Transport—but it brought up a big problem. To precision-shape the caps to the contour required, the machine bed had to be perfectly flat. The bed was chilled cast iron, 40 feet long and 27½ inches wide. Truing such a large surface by grinding couldn't be done—the experts said.

But a Robertson Wheel, driven by a 1 hp motor, proved the experts wrong. The job was done right . . . and on time. The wheel used was a standard Robertson 4/3 x 1½ x ½ Type 11. A small wheel for a big job. The average stock removed was .015 inch. True flatness of bed was achieved to an accuracy of .0025 inch.

It-couldn't-be-done jobs are everyday fare for Robertson Grinding Wheels. They're precision built for the toughest jobs industry has to face. Prove it yourself. Blueprint your problem and let us recommend a wheel that will solve it.



Accuracy Is the Axiom for Aviation Products. *Checking the contour of a spar cap for accuracy.*

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Precision PLUS +

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GAGE GRINDING
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OTHER
CLOSE
TOLERANCE
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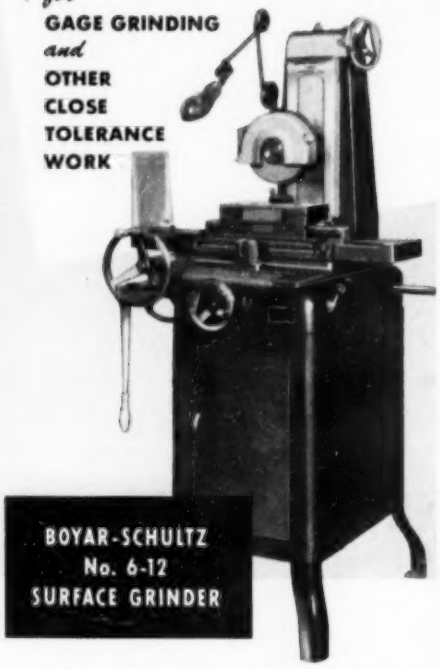

BOYAR-SCHULTZ
No. 6-12
SURFACE GRINDER

HERE is the New Grinder Sensation of the decade . . . with all the features the metal working industry has been talking about PLUS—

Flatness and parallelism GUARANTEED to within 2/10 (.0002). Low First Cost. Easy Operation. 8 to 10 Weeks Delivery.

The excellent performance of this machine tool, that has been *proved* in so many shops, is the net result of unusually sturdy design, fine quality materials and the untiring efforts of skilled craftsmen who know what a fine precision machine tool should do.

Boyar-Schultz No. 6-18 Surface Grinder

A heavy duty, precision tool room machine built for sustained accuracy in both tool room and in production.

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for larger precision work

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production flows smoothly...
at top speed, at all times, yet free of rejects

Kester makes 62 different fluxes to meet any requirements. Why not write our Technical Department for full information?

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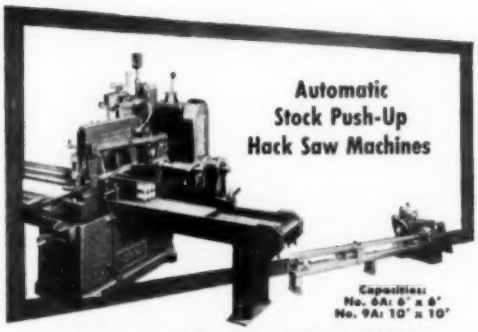

Automatic Stock Push-Up Hack Saw Machines

Capacities:
No. 6A: 6" x 6"
No. 9A: 10" x 10"

Feed, Measure, Cut-Off—AUTOMATICALLY

These automatic stock push-up hack saw machines are not new. MARVEL built the first practical bar feed hack saw machines, over 30 years ago. The sound, proven, basic principle of these machines has never changed—but they have been constantly improved and refined. Today they are still the leaders—the most practical, fastest, most accurate, most productive cutting hack saw machines built. No matter what your cut-off work, let us recommend the MARVEL saw that will give you true economy, speed and accuracy at an attractive price.

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MARVEL SAWS
Better Machines—Better Blades

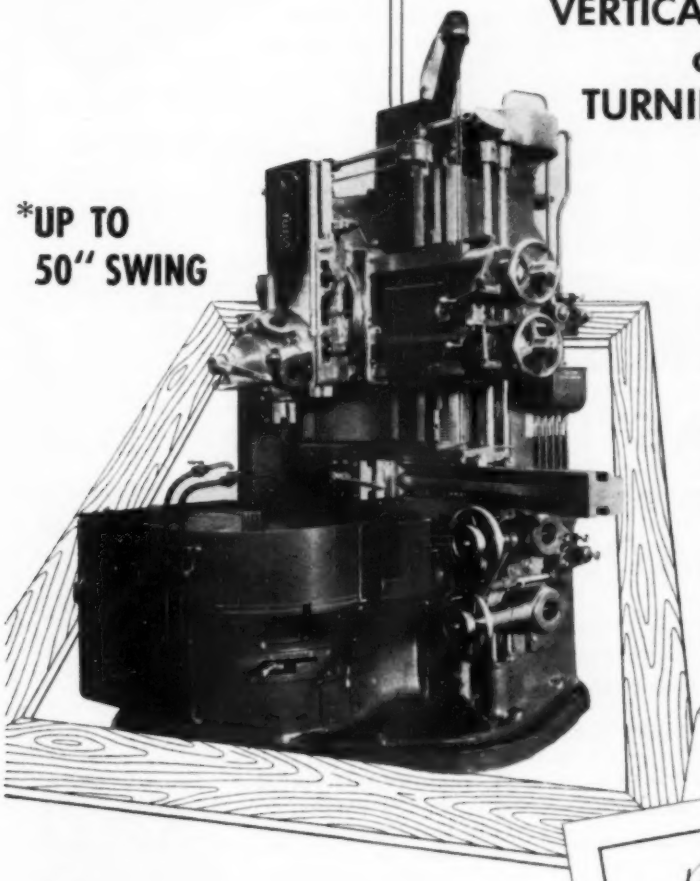
ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. — Chicago 39, U. S. A.

for faster set-ups
and precision plus...

NILES 42"

SIDEHEAD VERTICAL BORING and TURNING MILL

***UP TO 50" SWING**



- Combines advantages of horizontal turret lathe, engine lathe and vertical turning and boring mill . . . *plus!*
- Center stop accurately locates rail-head and maintains perfect alignment with center line of table spindle.
- Cross rail guide assures perfect alignment between cross rail and table in all positions of cross rail.
- Simplified and convenient controls.
- Designed for *fast set-ups*.
- Spiral bevel gear drive.
- Anti-friction radial and thrust bearings.

***50" Swing available with Sidehead lowered below table surface.**

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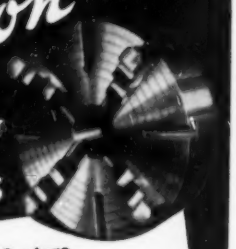

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Gives Jaws "Steel Finger" Action

- Tighter Gripping
- More Rigidity
- Greater Accuracy
- Even Distribution of Pressure

Try it yourself. Pick up a piece of work in your fingers. That's ordinary holding. Now squeeze . . . that's Whiton Multi-Thrust "Steel Finger" action.

Work Holding Problems? Write Whiton

Ask for catalog, too.

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THE WHITON MACHINE COMPANY
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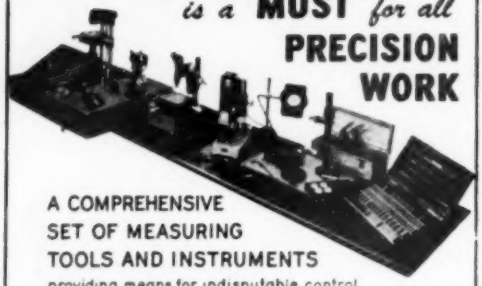
SCHERR LIMITED BUDGET INSPECTION LABORATORY

is a **MUST** *for all* **PRECISION WORK**



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THICKNESS, DIAMETERS, LENGTHS, PROFILE, SHAPE AND FINISH — Simple in construction, reasonable in price, and fully reliable for unerring accuracy and wherever possible independent of the human element of "feel".

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Dependable Delivery Promises

ALSO

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DORMAN AUTOMATIC REVERSE TAPPERS

4 Sizes • Friction & Positive Drives • Capacity: 7/16 to 2" on Steel

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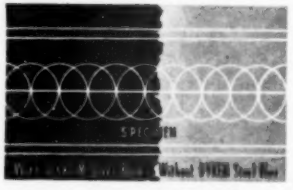
STOPS LOSSES making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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Straight Side Press

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clean metal parts in one fast "step" with Vapor Degreasing

For a highly efficient, nonflammable solvent use DU PONT "TRICLENE" D

TRICHLORETHYLENE

In wide use for many years, Du Pont "Triclene" D Trichlorethylene possesses ideal properties for modern metal cleaning. It's stable and pure . . . stands up under moisture, air, heat and other destructive influences. Control and maintenance of degreasing operations are easier because of "Triclene" D's high purity and narrow boiling range. And "Triclene" D is nonflammable for complete safety in use.

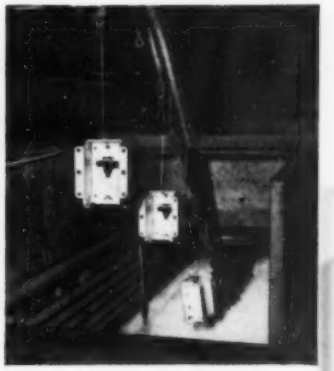
"Perclene" perchlorethylene—another Du Pont solvent for vapor degreasing—is particularly suitable for certain operations requiring a higher boiling solvent.

DU PONT TECHNICAL SERVICE

A call to your Du Pont Solvent Distributor will bring prompt, practical advice from experienced technicians in the metal cleaning field. They'll be glad to tell you about "Triclene" D and assist you on metal cleaning problems.

. . . MANUALLY OPERATED

Circuit breaker unit is thoroughly cleaned in less than a minute by vapor degreasing. Equipment is simple and timesaving . . . handles metal parts of all sizes.



. . . CONVEYORIZED

Switch housings emerge clean, warm and dry from vapor degreasing unit. Conveyor system maintains smooth, even flow of housings at high production speed.

Intricate electrical equipment parts, made of all types of metal, are thoroughly cleaned by vapor degreasing with Du Pont "Triclene" D Trichlorethylene. Parts come out clean, warm and dry, instantly ready for inspection, finishing or further fabrication. The heaviest oils and grease are completely removed—usually in less than a minute!

Compact vapor degreasing units require a minimum of floor space and can be adapted to conveyorized or manual operation. Cleaning costs remain low, since contaminated solvent is readily recovered for economical re-use. That's why vapor degreasing is first choice among manufacturers for low-cost, efficient metal cleaning over a wide range of production capacities.

Perhaps vapor degreasing can mean increased efficiency in *your* metal cleaning program. The coupon below will bring you complete information.

Mail the coupon below for more facts on vapor degreasing

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DU PONT *flammable* SOLVENTS for VAPOR DEGREASING

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Please send me detailed information on Vapor Degreasing: applications, advantages, equipment used, and Du Pont solvents available. We are interested in cleaning _____ products.

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FAST WORK!

WITH GRIPCO LOCK NUTS

APPLIED FAST!

Gripco Lock Nuts are started on the bolt threads *fast* just like a common nut.

LOCK FAST!

When the Gripco deflected threads contact the bolt threads, the nut is seated *fast* and locked with a wrench.

HOLD FAST!

Until it is removed with a wrench. *Gripco Lock Nuts* can be removed and reapplied many times without appreciable loss of locking effectiveness.

GRIPCO LOCK NUT
makes the Bolt-Thread End as secure as the Head End.

GRIPCO PILOT-PROJECTION WELD NUTS

Also *applied fast*. The pilot positions the nut quickly and accurately, and it is instantly attached by resistance welding.

GRIPCO COUNTERSINK WELD NUTS

Weld Fast! The slanting "countersink" section catches loose metal particles and slides them down the slanting "countersink" surface away from the threads. No re-threading required!

GRIPCO WELD NUTS *are furnished with either lock or plain threads.*

5450

GRIP NUT COMPANY
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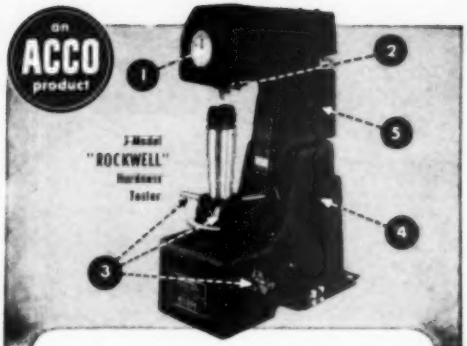

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There are two models of WILSON "ROCKWELL" Hardness Testers, plus the TUKON for micro-indentation hardness testing. Write for information.

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WILSON "ROCKWELL" and TUKON Hardness Testers

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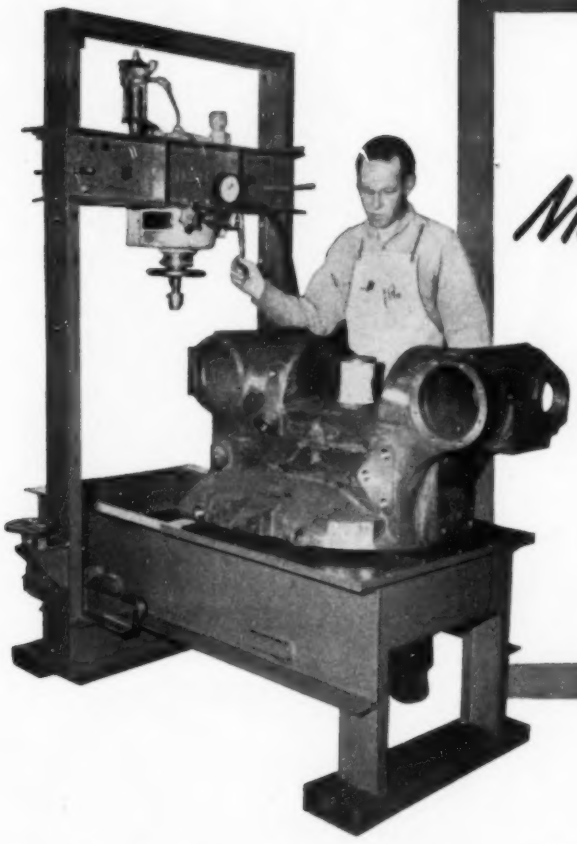

Dake Movable Frame Presses

let you move the press over the work

If you have difficult pressing jobs, these gantry-type presses developed by Dake hydraulic engineers may be just what you need to handle them. Dake Movable Frame Presses enable you to bring the press to the work, instead of work to the press.

Awkward parts or assemblies are easily loaded on the work table by crane, hoist, or fork lift. Then one man can easily move the press frame over the part and move the workhead along the top channels to center it accurately over the work. Workhead and channels may also be raised or lowered to accommodate for work height.

Dake Movable Frame Hydraulic Presses are designed for hand, electric, or pneumatic operation, and are available in 25, 50, 75, and 125-ton capacities. Complete information and specifications are given in Bulletin 269 just published . . . copy on request.

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QUALITY
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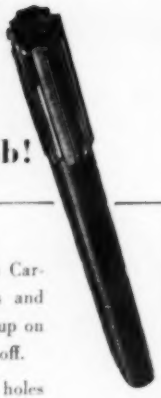

THE superior quality of Staples Carbide-Tipped Expansion Reamers and other circular cutting tools shows up on the production line, where it pays off.

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Tell us your requirements, and our engineers will gladly make recommendations.

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A complete line of Circular Carbide-Tipped Cutting Tools
Expansion Reamers — Special Tools

M&M giant keyseaters

M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

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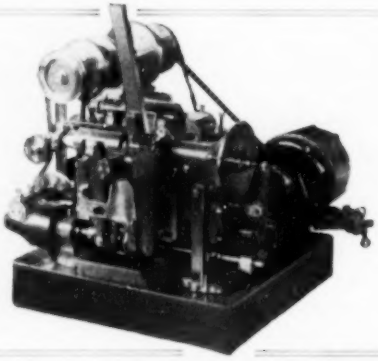

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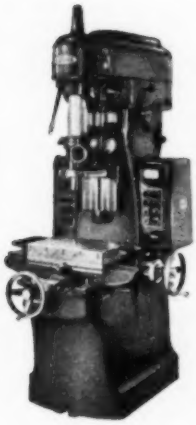
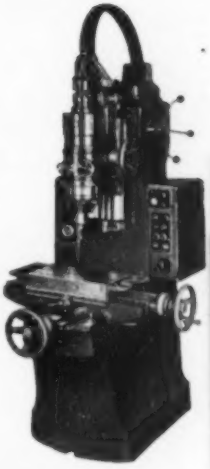


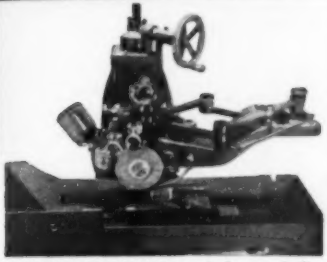
No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

No. 2 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from $\frac{1}{64}$" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.

No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

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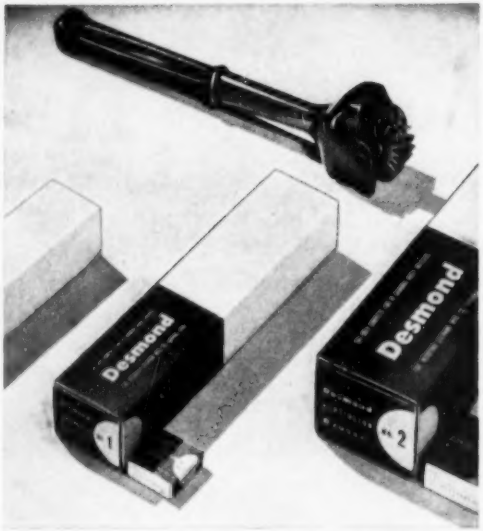
JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

specify genuine **DESMOND-HUNTINGTON DRESSERS**



and genuine Desmond-Huntington cutters and parts

For best grinding wheel dressing results—for longest cutter life—for complete satisfaction—ask for **Desmond-Huntington** by name. When you do you'll be certain to get:

Cutters milled from high carbon steel, hardened all the way through. Quality steel, accurate milling, eighteen long cutter teeth, plus experienced heat treating assures satisfactory dressing and cutter life.

Cutter bushings of hardened steel, which permit cutters to revolve with minimum friction and heat from radial loads.

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Cutter pins of special hardened steel, accurately made and easily replaceable.

Specify Desmond—the only complete line of grinding wheel dressers, for all requirements—stocked and distributed by selected Desmond Industrial Distributors . . . **The Desmond-Stephan Mfg. Co., Urbana, Ohio.**

Desmond

the only complete line of grinding wheel dressers and cutters

FAR LESS TIP BREAKAGE with "RING SEAT" CENTER DRILLS

2 to 4 Times Longer Life

Look carefully at the illustration above and you will see how the "Ring Seat" Center Drill differs radically from old type drills. Note that the tip diameter is larger than the body of the tip section. Note also the curved contour—no sharp angles. The result is much longer life—2 to 4 times, according to actual performance records of users. Far less tip breakage too—because the spiral groove is designed to facilitate the outward flow of chips and eliminate chip-jamming which is a common cause of tool breakage.

Reduces Production Costs

Besides reducing tool expense because of its longer life, the "Ring Seat" Center Drill eliminates such operations as de-burring and center grinding, further reducing production costs.

A PREMIUM DRILL AT NO EXTRA COST

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HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

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Automatic Dieing Machines combine high speed with long die life in production of metal stampings.

See pages 82-83
March 3rd, American Machinist

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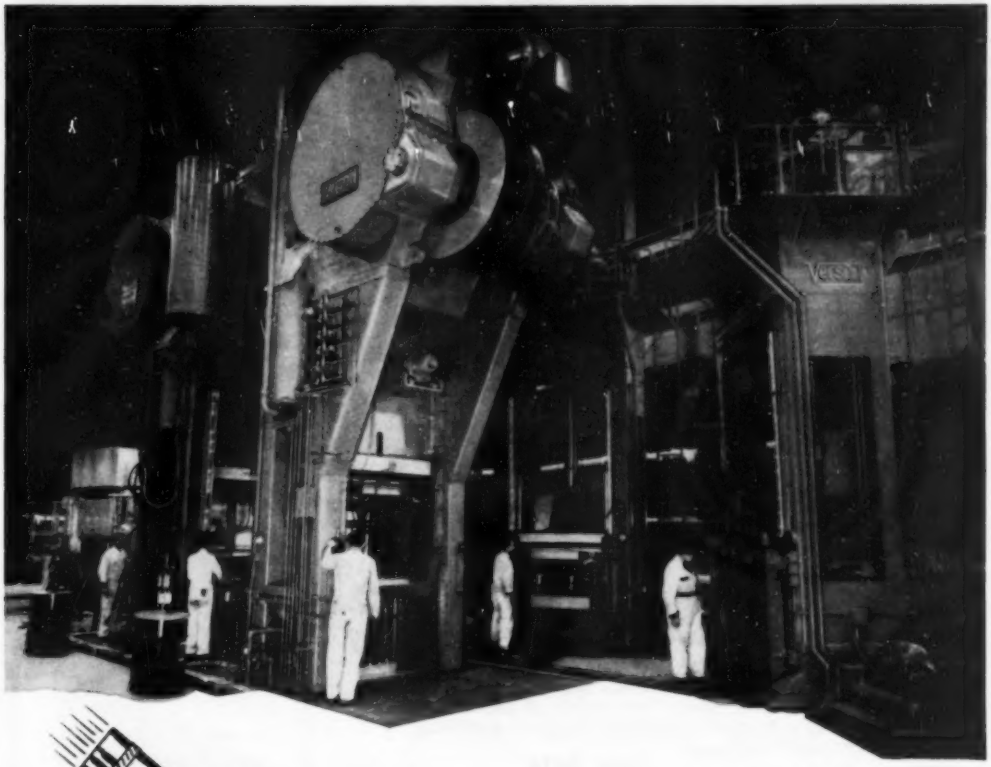
THIS ....Verson.... AUTOMATIC TOOL-UP

speeds production of large caliber projectiles



IN a tool-up developed by Verson and consisting of Verson presses and tooling, 90, 105 and 120 mm. projectiles are produced automatically from billet to finished forging. Production is increased 25% over previous methods; skilled manpower requirements are reduced substantially; material consumption is cut 15% resulting in big reductions in machining time.

When the photograph reproduced above was made, the tool-up was in the process of being set up. Completed, the tool-up incorporates conveyors for automatic handling between operations and automatic handling in the press.

This tool-up illustrates how Verson engineering can speed production and cut the cost of vitally needed defense materials. We will be pleased to send you additional information on this projectile tool-up or to discuss your needs with you. Write or phone.

See a pictorial display of this projectile tool-up at the Verson booth at the Tool Show in Chicago, March 17-21. Samples of the forgings will be available for your examination.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

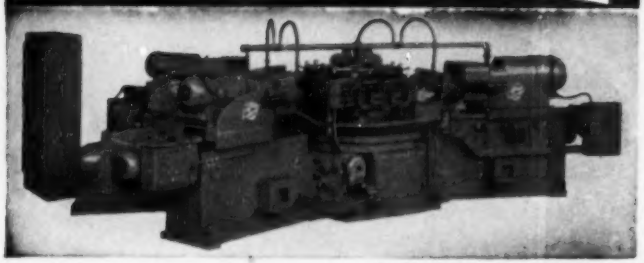
9316 South Kenwood Avenue, Chicago 19, Illinois — **So. Lamar at Ledbetter Dr., Dallas 15, Texas**

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

Drilling and Reaming

388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

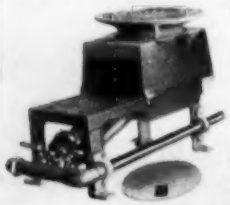
DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6111 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

BUZZER *Gas Fired* **FURNACES**

NO BLOWER OR POWER NEEDED . . . *just connect to gas supply*



Here's speed, economy and lifetime service in this most efficient and economical soldering and general purpose bench furnace. This 522 furnace heats a pair of 12 lb. soldering coppers in 8 minutes. Can be used for melting lead, heating small tools, etc. Since 1911 BUZZER Soldering Furnaces have been the equipment of thousands of industrial plants, shops and schools. *Write today for catalog showing various types of furnaces, burners and other equipment.*

CHARLES A. HONES, INC.

121 South Grand Avenue, Baldwin, L. I., N. Y.

SAVE WEAR

on MACHINE TOOLS . . . CUTTING TOOLS

Extract Iron and Steel Particles from Coolants and Lubricating Oils with the **FRANTZ**

FERROFILTER®

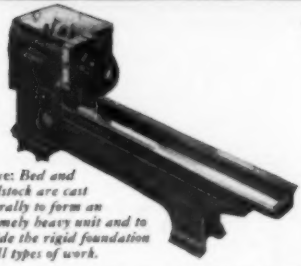
A stack of grids is magnetized by a pair of powerful Alnico permanent magnets to remove chips and particles as fine as one micron. Cleans lubricating oil to protect all wearing surfaces . . . filters coolants and cutting oils to provide finer finishes, longer pump and tool life.

Send for BULLETIN 57

S. G. Frantz Co., Inc.

P. O. Box 1138 Trenton 6, N. J.

Manufacturers of Permanent Magnet and Electromagnetic Separators



Above: *Bed and Headstock are cast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.*

Below: *Block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".*

ACCURACY THAT DOESN'T "WEAR OFF"

Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and maintain—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid support possible.

Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

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The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. **A.M.**

NEW ADVERTISEMENTS: Address N.Y. Office, 330 W. 42 St., N.Y. 36, N.Y. for March 31 issue closing March 18.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

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Well established plant, specializing in industrial gears.

Reputable concern, 30 years in business, doing over $900,000 annually, with 6 months backlog profitable orders.

Plant may be merged with large organization needing gear production or continued in present location with lifetime chance for right party.

BO-3564, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

CHIEF ENGINEERS, TO $15,000
DESIGNERS—all kinds, TO $10,000
TOOL DESIGNERS, TO $10,000
DETAILERS, DRAFTSMEN TRAINEES
FREE
To applicants. Employers pay our fees
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WABASH EMPLOYMENT AGENCY
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CLOGGED SEWERS?

Our rebuilt electric drain cleaning machine with 5-year guarantee cleans drains 2" to 12". Write:

ELECTRIC DRAIN CLEANING CO.
BOSTON 34, MASS.

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WE OFFER

PRECISION ELECTRO-MECHANICAL INSTRUMENT MANUFACTURING FACILITIES

Suitable to produce US-sub-Contract assemblies and components. Also civilian products.

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Screw Machine to 2¼" diam.; Flat Crush Form Grinding 12"x36" (suitable for jet engine parts); Honing to 1" diam.; Complete Metal Fabrication Facilities.

Standard Button Machine Co., Inc.
245 Franklin Street Paterson, N. J.

WANTED—SUB-CONTRACTING WORK
BENCH LATHE — DRILL PRESS

Hand assembly of small parts. Guaranteed Accurate to Your Specification. Send Drawings for Quotation to:

P. MODE MACHINE TOOL CO.
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WANTED
Sub-Contracting Work
STRAIGHT BEVEL • GEAR CUTTING
• *Excellent equipment* • *Immediate Service*
SIER-BATH Gear & Pump Co., Inc.
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N. Y. Phone PE 6-8132 N. J. Phone UN 5-3019

PATTERNS in WOOD and METAL
For All Kinds of Castings Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.
GENERAL PATTERN WORKS
2233 Rack Street Cincinnati, Ohio

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of AMERICAN MACHINIST—about your facilities. Write for rates.

CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 36, N. Y.

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ENGINEER WANTED. Machine tool company located in Indiana has an opening for a machine designer capable of becoming Chief Engineer over small engineering department. This permanent position with a progressive company will furnish a qualified designer with opportunity limited only by his capabilities. Reply to P-3327, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITION WANTED

GRADUATE METTALURGIST with ten years experience in metallurgical and mechanical development work and qualified as metallurgist or ass't metallurgist for metal fabricating or manufacturing plant will be available in about two months. PW-3594, American Machinist.

SELLING OPPORTUNITY WANTED

GRADUATE MECHANICAL Engineer. Age 34. Eight years engineering experience, four years industrial sales experience. Desires to become Manufacturers Agent or Distributor for a quality product. Connecticut area. RA-3509, American Machinist.

WANTED

WANTED VERTICAL BORING MILL

Used Vertical Boring Mill. 14 to 16 ft. dia. Give description.

STANDARD STEEL CORP.
5001 Boyle Ave., Los Angeles 58

WANTED
Used or Rebuilt — Automatic Cold Nut Forming Machine

Prefer Waterbury-Farrel or National. Capacity ½". *Must be in good condition.*

W-3540, AMERICAN MACHINIST
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MACHINERY COMPANY

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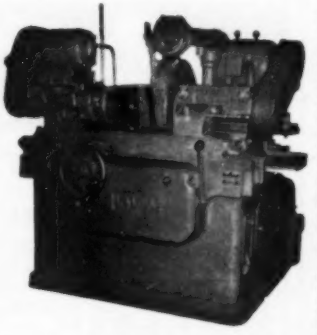
Every Item Guaranteed as Represented

AUTOMATIC, #00 Brown & Sharpe, 5/16" cap.
AUTOMATIC, Cleveland Model #B-1½" Spl. Spdl.
AUTOMATIC, B & S #20, 1" Cap. M.D.
AUTOMATIC, National-Acme Spin. Spdl. 4½",
BALANCER, Anderson Bros. 14"x64", Rolo-Checker.
BORING MILL, 60" Betts Vert. 2 heads.
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11, Horiz. 5½" Bar.
BORING MILL, 24" Bullard M.D., V.T.L.
BARRELS, Tumbling Locomatic, Baird.
BRAKE, Chicago #812 Hand Bending.
BRAKE, Chicago #183, 8'x3/16" cap. late.
BROACH #1 LaPointe Horiz. 50" Stk.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP. M.D.
CRANE, OET Shaw 10 tons, 58'0" span.
CRANE, Canton #6 Portable Gooseneck 3 ton cap.
CRANE, OET Ricker 2 tons 11'9" span.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CUTTER, 72" Gruenen Automatic Paper, M.D.
RADIAL DRILL, 3'0" American, M.D.
RADIAL DRILL, 3'0" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford
RADIAL DRIL, 6'18" American, M.D.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn M.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #2B, 3 spdls. #2 M.T., 16".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Natco MuHiple Spdle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DEEPFREEZE Motor Products 40° below zero.
DEMAGNETIZER, SD-011 Magnaflux, late type.
FILING, #3 Thell & Sawing, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Hackler Steam Oven, Serial #3543.
GRINDER, Disc, Besly #205, 18" Dble. End.
GRINDER, Arter 16" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, Heald Rotary #25, M.D.
GRINDER, Hydraulic Contour Landis Cam 5"x40".
GRINDER, Cylindrical, Norton 18"x36", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Cylindrical, Cinel. Grit Pilmatic.
GRINDER, Thread, Jones & Lamson #TG-015.
GRINDER, Landis Crankshaft 10x32 Hydraulic, M.D.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic.
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.

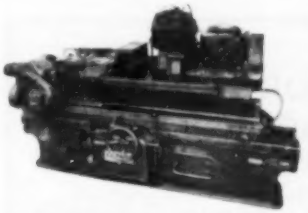


LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, #22 Heald Horiz. Rotary Surface.
GRINDER, Diamond Snagging 10 HP. 24"x4½".
GRINDER, Norton Gal3 Vert. Surface, Hyd. Late.
GRINDER, #1 Moore Jig M.D. Late.
GRINDER, #00 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, Porter-Cable #B-3, 10" Belt, M.D.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 2002 Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
KEYSEATER, #5 Mitts & Merrill Giant, M.D.
KEYSEATER, #6 Mitts & Merrill Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

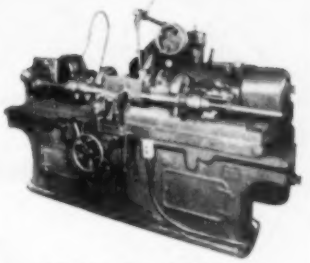
DISC GRINDER

Osterheim 27" Wheel Diameter Disc Grinder 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



LANDIS Type "D" 5" x 40" Motor Driven Hyd. Semi-Auto. Cam Contour Grinder. Equal to New.

LATHE, Lo-Swing 8"x100", M.D., A.C.
LATHE, Porter-Cable 9"x18" Geared Head Prod.
LATHE, Hendey 12"x24", G.C.G. Taper Attach.
LATHE, LeBlond 14"x8', G.C.G.
LATHE, Hendey 14"x8' G.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x6', G.C.G., Grd. Hd.
LATHE, American 16"x8' G.C.G., Grd. Hd.
LATHE, Lehman 18"x7' G.C.G., M.D.
LATHE, Lodge & Shipley 18"x8', G.C.G., Gr. Hd.
LATHE, American 18"x10' G.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bead, G.C.G.
LATHE, Hendey 20"x10' G.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, LeBlond 22"x10' G.C.G., M.D.
LATHE, Putnam 24/32"x12' G.C.G., M.D.
LATHE, LeBlond 24"x14' G.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', G.C.G., M.D.
LATHE, McCabe 26/40"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' G.C.G., Grd. Hd.
LATHE, Pond 36"x100" Grd. Hd. With Equip.
LATHE, Bulling Dble. End 2 VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½",
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
MILL, Nichols, Hand, Coolant, M.D. Late Type
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0V Brown & Sharpe Plain Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5, High Power.



LANDIS 10 x 32 Crankshaft Grinder.

MILL, #3 Cinc. Univ. Horiz., M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinc. Vert. & Horiz. Prod. Late.
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #0 Versus Hand Mill, M.D. Late.
MILL, PLANER, Ingersoll 42x38x12, 4 heads.
MILLING MACHINE, LeBlond #4, Horiz. Univ.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B Horiz., M.D.
NIBLER, Gray Turret Type ¼"x24" cap.
NIBBLER, #2 Savage Roller Die 9/16"x36" cap.
OZALID Model "F" Whiteprint Machine, Late.
THREADING, Blaybolt Lassiter Millholland 1½",
THREAD MILLER, Lees Bradner #40A Automatic.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
PLANER, 48"x48"x12' Cleveland Openside.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 39"x24" Bed Area.
POWER PRESS—Bliss-Consolidated #160-B Straight Side Dble. Crank, 45 tons.
PRESS, #79½ Bliss S.S. 9½" Str. M.D.
PRESS, Robinson #5 O.B.I. 83 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #1S, #19, #30, #31, OBI, A.C., M.D.
PRESS Toledo 58½ S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 90 tons #3W.
PRESS, 60C Bliss Double Action, 3 crank.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #3B Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hooker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH H & J #5 Sgle end, 40" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Pens. Tubular Rivet.
ROLLS, #1 Buffalo Forge Vertical Bending, NEW.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W2400, Geared, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade.
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x9" cap.
SAW, Band, Tannewitz &GH-36" High Speed.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 22" Cinci. G.E., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 30" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork S-1 Rotary 60° Thrust, 10 ga.
SHEAR, #9E Niagara M.D. 8"x3/16" cap.
SLOTTER, 12" New Haven Vertical, M.D.
SPRUE CUTTER, Milwaukee 50 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

WIRE WRITE PHONE

YOUR NEEDS FOR MACHINE TOOLS

HUNDREDS OF FINE CALIBER TOOLS AVAILABLE

BORING MILLS • LATHES • TURRET LATHES
BROACHES • PLANERS • SCREW MACH.
DRILLS • MILLERS • SHAPERS
GRINDERS • HEADERS
ARSENAL EQUIPMENT • AUTOMATICS
GEAR MACHINERY

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NEW HAVEN CONNECTICUT

FINE LATE TYPE GUARANTEED TOOLS

60"x20' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse

56"x18' C.M.C. Heavy Duty Lathe, 24 Speed Geared Head, power rapid traverse, 30 HP AC motor

24"x10' centers LODGE & SHIPLEY 12 Speed Geared Head Engine Lathe, taper attachment

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

No. 5 FOSTER Ram Type Universal Turret Lathe, bar feed, taper attachment, motor in base

42" BULLARD Spiral Drive Vertical Turret Lathe

24" BULLARD New Era Type Vertical Turret Lathe, side head, motor drive, threading attachment

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse, new 1932

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, No. 40 taper, new 1942

No. 2B KEARNEY & TRECKER Plain Horizontal Mill, AC—MD

No. 4B KEARNEY & TRECKER Plain Horizontal Mill, motor in base, rapid traverse, vertical head

No. 5 CINCINNATI Plain Horizontal Mill, rectangular overarm, MD

No. 5-60 CINCINNATI Plain Hydromatic Mill, 1942

No. 3 AVEY Type MA6—4 spindle Drill, Aveymatic power feed, No. 3 Morse taper, new 1942

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 56 Tons

72A5 Heald Sizematic Internal Grinder
25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

12"x28" LANDIS Universal Tool & Cutter Grinder, with all attachments, new 1938

36" ROCKFORD Hydraulic Openside Shaper Planer

36"x36"x10' G.A. GRAY Maxi-Service Planer, reversing motor drive, box table, rapid traverse

75 Ton HENRY & WRIGHT Double Crank Dieing Machine, roll feed & scrap cutter

O'CONNELL MACHINERY CO.
Tel. BAiley 5800
1695 GENESEE ST. BUFFALO 11, N.Y.

MODERN MACHINES

#3 Brown & Sharpe Vertical Milling Machine
60" Hanchett Face Grinder
Baush Multiple Spindle Drill, Type W7
6D Potter & Johnson Automatic Chucking Machine
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turner Drives
#3 Barber Colman Hobbing Machine
6" A Acme Gridley 1½" Automatic Screw Machine
10" Gould & Eberhardt Shaper
(2) #3 Cincinnati Millers-Ser. A1004 and A1004
#3 Standard Plain Kearney & Trecker Miller—Ser. 211
1520

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

SCARCE MACHINE TOOLS

NILES 10' Vert. Boring Mill, 2 Heads, M.D.
INGERSOLL Planer Type Mill, 4 Heads, 36" x 24" x 20'
CINCINNATI 36" x 36" x 16' Planer, M.D.
WOODWARD & POWELL 42" x 42" x 36' Planer, M.D.
HEALD #81 Centerless Internal Grinder
HEALD #22 Rotary Surface Grinders

National Machinery Exchange
138 Mott St. New York 13, N. Y.
"If It's Machinery, We Have It"

FOR SALE

HORIZONTAL BORING MILL

1—Barrett floor type, 20 H.P., 220 V. DC motor drive—400-1600 RPM 6" Boring bar with 3¾" extension bar 36" from bar to table. Table 19'0" long. Cutters and heads to bore 8" to 36". Can be seen in operating condition.

AMES IRON WORKS
OSWEGO, N. Y.

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
G&L: #3 Tool and Cutter Grinder
GLEASON: #12 Cutter Sharpener
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
ARCHDALE: Radials (New)
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
FELLOWS: #4 Enveloping Gear Cutter
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE No. 23, capacity 10"x48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts

Grinders—Cylindrical—Cont.

LANDIS: 6x18" External
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel
NORTON: Crankshaft, 23"x72"

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: #5 Internal
BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless
LANDIS: Hydraulic, 8" stroke x 15"

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

AKTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES

BARNES: No. 306H Vertical, 24"
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

DIMCO: Geared Head 12" to 66" swing (New)
AMES: 1" Bench, with attachments (New)
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
ERNAULT: Toolroom lathes, 11 to 20" swing (New)

LATHES—Production—Cont.

ERNAULT: High production hydraulic duplicating and copying lathes (New)

LATHES—TURRET

HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)
MOREY: #2G

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
CINCINNATI: #0-8 Vertical Millers, Automatic Type
DIMCO: #2 and 3 Univ. (New)
DIMCO: #3 Vertical (New)
KENT-OWENS: #1-8 Hydraulic Plain
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work
HPM: 1500 ton Hydraulic Briquetting Press, 24x48 platen (1943)
GEN. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10' Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

MISCELLANEOUS

RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: HPM 1500 ton Briquetting
PRESS: Screw. Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New)
SHAPERS: Hercules 22" (New)
SHAPERS: Dimco 16 to 33" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HEADLINERS

MILLING MACHINES

No. 2 Cincinnati High Power Plain
No. 2 Kempsmith Universal, Turner Drive, vert. hd., slotting attach.
No. 3 Kempsmith Universal, Lima Drive
No. 2B Heavy Brown & Sharpe Plain
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
No. 00 Sundstrand Hydr. Rigidmil, 1942
48" Cincinnati Plain Automatic
32"x24"x16' Ingersoll Adj. Rail Planer-type

LATHES

30"x174" centers Hamilton, Lima Drive
24"x112" ctrs Lodge & Shipley, Turner Drive, taper
24"x60" ctrs American Hvy. Pat. 12-speed Grd. Hd., taper
24"x51" ctrs Lodge & Shipley Selec. Grd. Hd.
21"x136" ctrs LeBlond Hvy. Dty., Turner Drive, taper
20"x96" ctrs Lodge & Shipley Selec. Grd. Hd.
20"x94" ctrs American Grd. Hd.
20"x72" ctrs Lodge & Shipley Selec. Grd. Hd.
20"x45" ctrs Lodge & Shipley Selec. Grd. Hd.
16"x36" ctrs Pratt & Whitney Model "B" Grd. Hd., m.t.l., taper
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
No. 608-PV Rivett Precision Toolmakers

PLANERS

42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads
60"x60"x32' G.A. Gray, 4 heads, excellent

TURRET LATHES AND AUTOMATICS

No. 3A Warner & Swasey Univ., bar feed
3"x36" Jones & Lamson "Hartness" Turret, bar feed, lots tooling, clean
Gess & DeLeeuw 4-spindle Automatic
No. 2A Warner & Swasey Universal 1⅞" Cone 4-spindle, bar feed

GRINDERS

20"x144" Landis Plain Self-cont., arr. m.d.
10"x24" Landis Plain Self-cont., m.d.
10"x24" Norton Plain, m.d.
6"x32" Norton Plain, m.d.
No. 10 Brown & Sharpe Plain, m.d.
No. 49—53" Besly Vert. Spdle. Surface, m.d.
No. 13 Brown & Sharpe Universal

GEAR MACHINERY

No. 1 Adams Hobber, arr. m.d.
No. 2 Barber-Colman Hobber, m.d.
No. 12 Barber-Colman Hobber, m.d.
No. 4 Cincinnati Cutter, m.d.
No. 18HM Gould & Eberhardt Double Spindle Hobber, s.p.d.
18" Gleason Str. Tooth Bevel Gear Generator, s.p.d.
18" Gleason Bevel Gear Tester
No. 17 Gleason Hypoid Tester, late
No. 7 Fellows High Speed Shaper, m.d.
No. 6I Fellows Gear Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

PUNCH PRESSES

No. 1B Bliss O.B.I., m.d.
No. 2 VKV O.B.I.
No. A3 Robinson O.B.I., arr. m.d. 32-tons
No. A4 Robinson O.B.I., m.d., 56-tons
No. 77 Toledo Open Back, b.d.
No. 2DT CANCO Deep Thrt. Horning m.d.
No. 5H Cleveland Horning, arr. m.d.

MISCELLANEOUS

10" Dill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
No. 14½ W&W Punch & Shear
Class F Bertsch Punch & Shear
18" Niles-Bement-Pond Slotter, cone
200 lb. Bradley Compact Hammer, b.d.
Model 3CAM Haskins Auto. Tapper, m.d.
2½"-6" Cox Pipe Machine, m.d.
1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

Send us your inquiries.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

IMMEDIATE DELIVERY

ROLLER LEVELLERS

McKAY ½" to 2" FOUR-HIGH LEVELLER
15" Diameter Rolls, (9) Leveling rolls, (11) backing up rolls, (2) Pinching rolls, (1) 300 HP motor for main drive, (2) 10 HP motors for screw down and (1) 2 HP motor for pinch roll adjustment.

McKAY ¼" TO 2" TWO-HIGH LEVELLER
13" Diameter Rolls, (11) Leveling rolls, (2) Pinching rolls, with 150 HP motor for main drive, (2) 7½ HP motors for screw down.

Above Machines Are New in 1943, Selling for 1/5 of New Cost, Used Only 6 Months.

PUNCH PRESSES

1400 TON COMBINED CAPACITY, BLISS #2ET-10 TRIPLE ACTION TOGGLE
650 Ton, 39" stroke, 75" shut height of plunger, 400 Ton, 28" stroke, 72" shut height of blankholder, 350 Ton, 12" stroke of lower ram, 62" x 86" bed area.

525 TON, BLISS #410A DOUBLE ACTION TOGGLE
25" stroke, 62" shut height of plunger, 17" stroke, 60" shut height of blankholder, 60 x 84" bed area.

500 TON, BLISS #48 STRAIGHT SIDE FORGING
10" stroke, 38" shut height, 30 x 19" bed area.

253 TON, TOLEDO #98-D DOUBLE CRANK, STRAIGHT SIDE
6" stroke, 20" shut height, 51 x 67" bed area.

200 TON, VERSON #48ES ALL STEEL, LATE TYPE
30" stroke, 23" shut height, 35½" x 37¾" bed area.

150 TON, CLEVELAND #60-D-84 DOUBLE CRANK
12" stroke, 29" shut height, 46½" x 86" bed area.

Many Other Presses in Stock from 5 to 1400 Ton Capacity

PAUL'S MACHINERY CO.

6111 VERMONT AVE. TYLER 7-6300
DETROIT 8, MICH.

BROACHES
#2-36 Cincinnati Hydraulic Vertical

DRILLS
Kingsbury Multi-way Double End—Late
15" Atlas Bench—1 Spindle (6) New
15" Atlas Floor—1 Spindle (3) New
2-3-4 Spindle Atlas—New
1¼" & 2" Cap. Progress—New

GRINDERS, BENCH
7" Diehl, Bench—(4) New

GRINDERS, PLAIN & UNIVERSAL
10"x36" Norton Angular Wheel Slide—L.T.
6"x32", 10"x36" Norton—Older

GRINDERS, INTERNAL
1616 Bryant—L.T.
72A3 Heald Sizematic—Older
72A3 Heald Plain—Older

SELLERS 6T WET TOOL GRINDER—L.T.

GRINDER, BROACH AND THREAD
3I & 3I Excello Thread—L.T.
YG6I5 Jones & Lamson Thread—L.T.

LATHES
18"x72" cc Lodge & Shipley—M.D.—G.H. Older
20"x115" cc Nundey—M.D.—G.H. Older
36"x84" Bridgeford—M.D.—G.H. Older

TURRET LATHES
#2 Simmons—Micro Speed—L.T.
#2G—1" Morey—L.T.

MILLERS HAND
#1 U.S.—L.T.—(2)
#1M Kent Owens—L.T.

MILLERS, PRODUCTION AND THREAD
M-18 Cincinnati Knee Type—Production—L.T.
#40 Lees Bradner Automatic Chucking, Thread—L.T.

PLANERS
48x48x12 Woodward—Older

PRESSES
25 and 50 Ton Dake Hand Hydraulic—New
9, 18, 12, 14, 15, 20, 30 Ton Presses
Perkins, Diamond Press Rite Perkins—New

SAWS
6 x 6 Peerless Hydraulic—Automatic Bar
8 x 18, 8 x 16 Kalamazoo—New

SCREW MACHINES
1⅝" Footsburt Automatic—L.T.

SHAPERS
14" Steptoe—M.D.

UNITED MACHINERY & TOOL CORP.

85 Central St., Worcester 8, Mass.

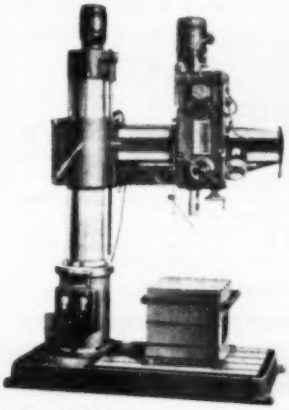
SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3½" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bemont-Pond 4½" Bar
Niles-Bemont-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Walker-Turner Radial, 2½'
Natco #12 20 spindle drill
24" Sibley Sliding head
Foote-Burt #25 1" cap.



ENGRAVERS

Gorton #1A, ME
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #2
Barber-Colman #12 Hobber (3)
Fellows High Speed Shapers 712, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

Bryant #5 Internal, chucking
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl.
Majestic Internal

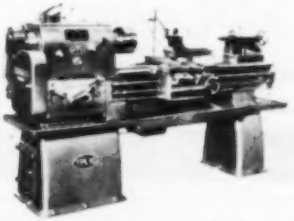
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius #96, K.O. Lee Tool
Sellers 6T Tool
Van Norman #666 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

Abrasive 8x24", #33 Vert. & #34
#10 Blanchard 16" Chuck
Blanchard #16, 24" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd., Coolant
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x42" and 12x30", 1941
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub
New 16, 18, 20", Immediate Del.



MILLS, PLAIN, UNIV. PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #3B Plain. Late, 3A
Brown & Sharpe #21, 2L Univ.
Cinn. 08 Plain, #2 Univ. Dial Type
Cinn. No. 3, 4 Plain Spd.
Hardinge Model BB4
Kent Owens 1V
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, Rigidmills
Sundstrand #3A Rigidmill with Copying Attach

MILLS, VERTICAL

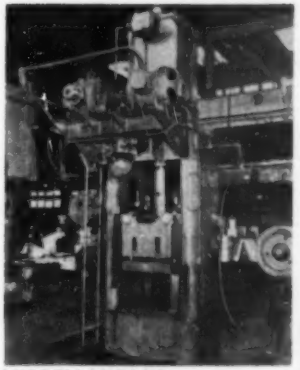
Brown & Sharpe #3 single pulley drive
Cincinnati #3, #4 hi-power
Cincinnati 08 Vertical
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss #630 Hi-Prod. Roll Feeds
Bliss 18, 21, OBI, 58, 62, 162, OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, 55, Bliss 74½
Hamilton 850 Ton S.S.
Niagara Herning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton

TURRET LATHES

Acme 6W Fox 2-9/16" Cap.
Brown & Sharpe, #2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #2B 2½" Cap.
Gisholt #2L Cross Sliding Turret
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, 5 Late



MISCELLANEOUS

Automatic, Cleveland Model B 1-1/16"
Automatic B & S #00G, 0G, 2G
Automatic 4 Sp. 1¼ Conomatic
Automatic: Bechler ¾" Like New
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Hacksaw: Peerless 6"x6"
Hacksaw: #6A Marvel 6x6 cap
Honer: Micromatic H-4
Keyseater: Davis, Baker, M & M
55 Bolt & Pipe & Threader
Oster-Williams #915 Pipe & Nipple Threader
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt. Many Others
Shears Power: George Ohl 10' 3/16", 10' x To gauge, 11' 16 gauge
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

150 Ton H.P.M. Triple Action Press 50 ton cushion, 50 ton blankholder, bed 36" x 36".
1500 Ton Briquetting or Powder Metal Press, horiz. clamp cyl. 1000 tons.
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
50 Ton William & White Gap Press, 20" St. 54" x 20" Bed—24" opening
600 Ton William & White Up-moving Ram 42"x60" platen 12" str., 24" opening self-contained

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton—Shaper 7" Amco, 8" Shaperite — Shaper Sheldon 12" — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes —Vert. Milling Attach. Helco H. S. Motors, Grinders, Buffers, all sizes.

This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.
"CABLE—AARMACH N. Y." Telephone WOrth 4-8233

DEPENDABLE MACHINES FOR IMMEDIATE DELIVERY

● PLANERS

12'x12'x30' SELLERS, 4 Heads
72"x36"x22' CINCINNATI, 4 Heads
72"x72"x14' N.B.P., 4 heads, widened bed
36"x36"x14' N.B.P., HEAVY, 3 heads
36"x36"x10' N.B.P., 3 Heads
24" CINCINNATI, 1 rail hd., B.D.

● SHAPERS

30" OHIO Square Ram
32" COLUMBIA, B.G., Power feed
20' GOULD & EBERHARDT V Ram
16" AMERICAN
16" OHIO, Hvy. Duty P.F.
16" MILWAUKEE, B.G. V Ram
15" MILWAUKEE, B.G.
8" SHAPERITE, Univ., New 1945
11" VERNON Power feed

● MILLS, HORIZ. BORING

3" ROCHESTER, P.F., No. 5 M.T., 9½" spdle.
No. 55 LANDIS, 3½" Bar
4" Bar DETRICK & HARVEY, No. 6 M.T.
4" Bar P. & H., No. 5 M.T.
4½" Bar NILES BEMENT POND
4 Spdle. FOX Horiz. Drilling Machine

● DRILLS

8 Spdle., INGERSOLL, Special Boring Machine, Grd. Head
41 Spdle. Special GREENLEE Multi
3 Way NATCO Horiz. Tapping Machine, Fixed center, lead screw type, M.D.
NATCO Spec. Horiz. Prod., 7 Horiz. Spdles.
11 Spdle. NATCO Multi., No. 1 M.T.
No. 2AH NATCO Holes'teel Vert. Multi.
BAKER-TRUNION Horiz. Prod.
No. 2 COLBURN, 22", No. 4 M.T., Hvy. Duty, P.F.
No. 210—21" BARNES, All Grd., 3 Spdle. 4 M.T.

● GRINDERS

12"x28" LANDIS, Univ. & Tool
6"x18" LANDIS, Cyl.
10"x18" NORTON, Cyl., P.F.
6"x18" NORTON, Vert. Surface, New '42
No. 5T SELLERS Tool, 2½"x2" cap., New 1941
No. 72 HEALD, Int., Hydr. Feed, Coolant pump
No. 72A HEALD "GAGEMATIC" INT., P.F., Hydr. operated table, 25 HP Motor.
No. 124—33 GARDNER Horiz. Disc. New 1945, 5½" Spdle.

● MILLS, VERT. BORING

Type "A", 18" 6 Spdle. BULLARD MULTI-AUMATIC, 6 station, 8" stroke
33" NILES BEMENT, 2 Hhds.
34" BULLARD
108" NILES, 2 rail heads
18" BULLARD CONTIN-U-MATIC, 4 station
6" 6 Sta. BULLARD, Mult-Au-Matic Type "A"

● LATHES

TURRET—

4-L GISHOLT, 9¼" Hole, 30" Swing
4-L GISHOLT Univ. Saddle Type 9¼" Spdle., 24" 4 Jaw Chuck
No. 3FU FOSTER "Fastermatic", New 1944
3R GISHOLT, New 1943, Grd. Hd. Saddle Type
3A W. & S. Hvy. Duty, Univ., Grd. Hd. 4¼" hole
No. 4-F FOSTER "Fastermatic", Flaton Type, Grd. Hd., 36" swing, 128" Bed
No. 6.2-6 DENVER ACME, 92" Bed
18" LIBBY, 3½" spdle. hole

ENGINE—

32"/47"x156" c/c LEBLOND Hvy. Duty, New 1947, 28' 7" Bed
32"x120" c/c SCHUMACHER & BOYE
36"x36' c/c BRIDGEFORD, 36' Bed
42"x16' c/c BRIDGEFORD, 24' Bed
42"x17'6" c/c HOUSTON STANWOOD GAMBLE, 26' bed
42"x24' c/c BRIDGEFORD, 32' Bed
48"x13' c/c LE BLOND, Heavy, New 1947
50"x20' 4" c/c PITTSBURGH, 29' Bed

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BLISS HYDRO DYNAMIC PRESSES

EXCELLENT CONDITION

TWO—100 Ton Capacity—4 Column Construction, 48" Stroke—Manufactured 1943
ONE—2000 Ton Capacity—4 Column Construction, 18" Stroke—Manufactured 1942
ONE—2800 Ton Capacity—3 Column Construction, 12" Stroke—Manufactured 1940

Presses are complete with integral pumping units, oil operating systems and electric controls.

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NO. 2 NORTON CUTTER and TOOL GRINDER

Serial No. 4253

New in 1941—with Standard Equip.

The Schobe Equipment Co.

860 Penobscot Bldg., Detroit 26, Michigan

BORING MILLS

42" Bullard New Era Vertical Turret Lathe

GEAR MACHINES

#50BM Multiple spindle Gould & Eberhardt Bevel & Spur Gear Cutter
16" Pratt & Whitney Two Wheel Hydraulic Gear Grinder
96"x10" Gould & Eberhardt Gear Hobber
#12—12" Gleason Two Tool Straight Bevel Gear Rougher

GRINDERS—CYLINDRICAL

6"x18" Landis Type C Plain Hydraulic—1941
10"x16" Landis Type C Plain Hydraulic—1940
24"x216" Landis Type C Plain Hydraulic—1940

GRINDERS—INTERNAL

#72A3 Heald Long Bore Sizematic
#81 Heald Sizematic
#81 Heald Gagematic

GRINDERS—SURFACE

#16 Blanchard High Power Vertical Rotary
Model B 14" Pratt & Whitney Vertical

GRINDERS—MISCELLANEOUS

12"x30" Cincinnati Universal—1940
12"x36" Norton Type L Universal—1941
Model KGC 22"x84" Crankshaft Grinder—1941

HEADERS

#250F Manville DSSD
#00 Waterbury Farrell DSSD
#11 Waterbury Farrel DSSD
#5 Manville DSSD
#2C Manville SSSD Ball
#180C Manville SSSD Ball
#3 Manville SSSD Ball

LATHES

14"x30" Centers Reed Prentice Sliding Gear Head—1939 (2)
29"x54" Centers Reed Prentice Sliding Gear Head—1939
16"x48" Centers Bradford Geared Head (3)—1940
18"x80" Centers Sidney Geared Head—1941
42"x40' Bed Putnam Heavy Duty Geared Head

MILLERS

24" Cincinnati Automatic Duplex (2)
Type FV5M2 Vertical—1942
54"x18" Ingersoll Slab Miller

SCREW MACHINES

4½" Four Spindle Cosomatic—Bar Feed—1944
#61 New Britain Multiple Spindle (½" (2)—1939
#438 Ceco Single Spindle Automatic—1942
#588 Ceco Single Spindle Automatic—1942

TURRET LATHES

#5 Gisholt Universal—1940
#6W Acme Universal—1940
#7A Jones & Lamson Universal—1944
#3A Warner & Swasey Universal
#4A Warner & Swasey Universal

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OUTSTANDING MACHINE TOOLS

AUTOMATIC SCREW MACHINES
BILLINGS & SPENCER #B2 DI-MATIC, auto. bar cap. 2¼" M.D. Late.
GYROMA'sIC Model 40 15/8" 6 spindle, Late.

BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #35 floor type; 3½" bar; M.D.
NILES 8" bar floor type, motor drive

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spindle, "A" Mult-au-matic
COLBURN 72" 2 heads PRT. M.D.
NILES 53"; motor drive (heavy)

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.

DRILLS—Radial
CARLTON 2'9" Plain, M.D. Late.
CINCINNATI BICK-FORD 6'15" Univ.; M.D

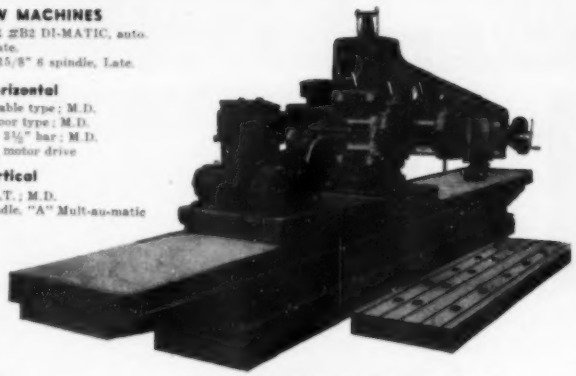
DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dual feed; M.D.
MOLINE 6-spindle Hole-Hog 3⅝"; M.D.
NATCO No. 14 Mult.; Rect. md.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 6&2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 15-LS Lapper; late
GLEASON 5" & 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tenser, Late Type
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 37", 71", 20" Bevel Gear Planers, M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #8A gear generator; M.D.

GEAR HOBBERS
BARBER COLMAN #12 Motor Drive
GOULD & EBERHARDT #36 H; Late
GOULD & EBERHARDT #26BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late
PFAUTER RS1: Max. dia. 30"; late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 6x18 cyl. Pl. Md.
CINCINNATI 14x72 Model EM Plain, Late
CINCINNATI Mod. EA 6x18 Pl. Cyl. Hydr.; M.D.
HEALD 72-A-3, 72-A-5 Plain; motor drive
LANDIS 10x36, 16x36 C Pl., Hyd., Late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 30" x 240" Plain cyl., M.D.

GRINDERS—Surface
ARTER 8" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder
HEALD #22 Rotary, 12" chuck; m.d. Late
PRATT & WHITNEY 14x36" Model B, Late
TAFT PIERCE 6" Rotary, M.D.



BILLITTER & KLUNZ Way-Grinder 48x196"

GRINDERS—Misc.
BRYANT No. 3, 5, 16-C-16, 16-CP-16, 24 Intl. Hydr.; Late
EXCELLO #48 Carbide Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 72-A-5 "Gagematic" In.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. EG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 629 Osc. type Radius; Late

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33" centers geared heavy
DENHAM 16x48", 12x84", 16x72" (gap), M.D.
JONES & LAMSON "FAY" 20x25" Automatic; M.D., Late
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24"x96" centers; Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 18"x72" centers, Model "BDD" Hardened ways, geared head, M.D.
NILES 20"x46', 30"x50' Boring; "Time-Saver"; Timken; Late
PORTER McLEOD 16"x8' geared, 12 speed QCG; NEW
SPRINGFIELD 14"x42", geared; M.D.
SUNDSTRAND 10x60" Auto. Late Type
SWIFT 16"x72" Centers, M.D. Late.

LATHES—TURRET
MOREY No. 2 ram type TIMKEN
GISHOLT 1L, Saddle type, M.D.
MAGDENBERG Model MWF-BG-250 Univ. table type; P.R.T.; 12" hole through spindle; cross sliding turret; M.D.; Late

MILLING MACHINES—Plain
BROWN & SHARPE No. 12 Plain; M.D.; late
CINCINNATI 0-8 Simplex; M.D.; late
CINCINNATI 4-48, 4 spindle, Tracer; Late
ROCKFORD Rigid-Mill #3 M.D.

MILLING MACHINES—Universal
CINCINNATI No. 3; dial type; H.S.; late
VAN NORMAN #26; motor drive

MILLING MACHINES—Mfg.
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
ROWBOTTOM Cam Miller
SUNDSTRAND Mod. 2A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod. EA Auto. PRT; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12", 84", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x36", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late

PLANERS
BETTS CONSOLIDATED 84"x92"x16' 4 heads PRT Box Table; DC Reversing M.D.
BETTS CONSOLIDATED 108"x84"x 44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
GRAY 36"x36"x10', 4 heads PRT. Late.
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x50' 4 hds.; Rapid Traverse; M.D.
NILES-BEMENT-POND 60"x60"x12' Rapid Traverse, 3 swivel heads, box table, M.D.

SAWS
ESPEN LUCAS No. 670 30" cap Hydr.; Late
HELLER Model SS-1, 6¾ Cap Cold Saw

SHAPERS—SLOTTERS
DILL 18" Slotter; motor drive
PRATT & WHITNEY 8" vertical; M.D.
PRATT & WHITNEY Mod. M 1251 16" Vertical
LYND FARQUHAR 26" Openside; M.D.
NEWTON 16" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late

PRESSES
BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIGELOW 225 ton Vert. Hydr; Late
BLISS No. 4-90A Toggle Drawing; tie rod; steel gearing
BLISS No. 2½A geared toggle; dbe. acting
GLEASON 10" Quenching; hydr.; M.D.
NATIONAL #5 H.S. Maxi-Press (Forging)
UNITED 500 ton hydr. forging
WATERBURY FARREL 125 Ton; M. Side

MISCELLANEOUS
ACME 2" Upsetter; Mod. AN; Motor Drive
ACME 2½ forging, upsetting; M.D.
BARR #5 Keyseater; motor drive
BARNES No. 1T, 5T4 Boring; hydr., Late
CHAMBERSBURG 600 H.P. Direct Gear
CROSS #40 Tooth Gear Cornering Machine
DeLAVAL No. 196 Coolant Clarifier; Late
FISCHER No. 1, Oil Groover; Late
GRUB US-20 Metal Band Saw—Fiber; M.D.
LANDIS 2" Dbl. Spdle. Threaders; M.D.
LEBLAND #2 Barrel Lapper; M.D.; Late
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Reedher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Reheaders; Late
MANVILLE No. 3C Thread Roller; M.D.
NIAGARA #116 Squaring Shear, Late.
NORTON 2F, Vertical Lapper; M.D. Late
QUICKWORK #5, ⅝" cap. #6, 1" cap.
REED Thread Roller, Late
SAUNDERS 8-18" Pipe Machine; M.D.
ULTRA LAP #10 Lapper, M.D. Late.
US TOOL 810-B Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller

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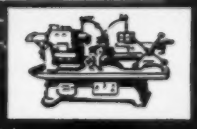

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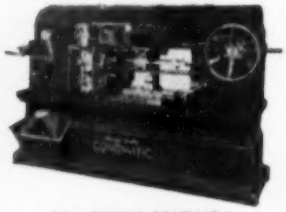
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
¾" Model F Gridley, 4 spdle.
1⅝" Greenlee 6 spdle., late
8¼" Conematic, 5 spindle
1½" Billings & Spencer Dimatic Cutoff



2" 4 SPINDLE CONEMATIC

GRINDERS
#25A Heald rotary surface, 30"
4 x 12" 4H Landis cylindrical
#2 Cinn. Centerless, plain
Model FG Micro Internal, Late
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
#300 Hanchett surface, 14x60"
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late
Oliver single point tool
Model 1311 P & W contour, late
#106 Rivett Internal
5 HP Marschke, single end

DRILLS
#3 Foothurt 6 spdle. #3 M.T.
#24 Foothurt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
36" Snyder single, #5 M.T.
#2 Detroit Semi-automatic, horiz.
Type 14 Natco 12 spindle
#2 Bausch 24 spdle., #2 M.T.
D6 Colburn, single spindle, #5 M.T.
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle, older

GEAR MACHINERY
#13LS Fellows lapper
672 B & S cutter
7A Fellows, shaper, high speed, key dty
61A Fellows, shaper, high speed precision

LATHES & TURRETS
14x36" Lodge & Shipley, 3 step cone
#1A W&S Univ., serial 260313
#2 Simmons Microspeed
#4 W&S, serial 327517
36"x17" ctrs. Bridgeport, g.h.
Hepburn Shell
Model LoSwing B x 108" centers, g. h.
Ginholt Simplimatic, platen type

SHAPERS & PLANERS
30"x30"x17" Cleve. Openside
20" G & E shaper, v ram
48x48"x14' Doltrick & Harvey dble. hdg
26" Smith & Mills shaper, 4 step cone

MILLS
#1M Cinn. vertical, late
#4 Cinn. High Power vertical
#1½B Milwaukee vertical
#3 B & S vertical
#3 Sundstrand Rigidmill, horiz.
#5 B & S plain horizontal
Briggs production, hydraulic
10C Van Norman Contour

FURNACES
Whiting Convertor, 2 ton cap., late
Model 3P Juthe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES
#57 Toledo, 150 ton, S.S., S.C.
#1 Minster OBI, 12 ton, 2½" stroke
#2 Minster OBI, 16 ton, 3" stroke
#4 Toledo OBI, 25 ton, 2" stroke
#2½ Niagara OBI, 45 ton, 2½" stroke
#29 Bliss arch frame punch, 32 ton, 2" str.
General Flexible power arbor, 5 ton
100 ton Niles wheel press
No. 411 Bliss dble. crank toggle 600 ton

MISCELLANEOUS
STRAIGHTENER: #2 Kane & Roach, 5/8" tube
PUNCH: Southwark sgle. end, 2" thru 1"
SPINNING RIVETER: Grant 5 spdle.
LAPPERS: 86-36" Gardner, vert. spdle.
BROACH: 10 ton Oilgear, model PED, late
HAMMER: 300# Bradley Upright Helve
BROACH: #4 Lapointe, horizontal
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZER: #2 Ajax High Speed, 30 ton
SHEAR: #23 Niagara 3' 14 gauge, late

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AUTOMATICS
No. 00 B & S Automatics (12)
No. 0 B & S High Speed Automatics (3)
No. 0 B & S Automatics (3)
No. 0G B & S High Speed Automatics (3)
No. 0G B & S Automatics
No. 2 & 2G B & S Automatics
9 18" DA2 Davenport Automatic
4½" Cleveland "A" Automatic
1⅝" Cleveland "A" Automatics, late (2)
1 1 18" Cleveland "A" Automatic, late
1" Greenlee 4 Spindle Automatic
0½"x8" Gosa & deLeeuw Checker

TURRET LATHES
24" Bullard New Era Vertical
No. 4A W & S Universal, serial No. 309,000
No. 3A W & S Universal
No. 2G Morey, late (3)
No. 2 Simmons, Bar, late
No. 4 W & S Universal GFH (3)

MISCELLANEOUS
No. 2 Norton Universal T & C Grinder
No. 21 Hanchett Opposed Disc
6"x18" Norton Type C Grinder, late
No. 1A Milwaukee Mill
24" Cincinnati Duplex & Simplex
No. 1½ B & S Universal
No. 3VG Reed Prentice Vertical
12"x30" Hendey GH Lathe, late
3" Gleason Bevel Gear Generator, late
No. 3 & No. 12 Barber Colman Gear Hobbers (8)
No. 95 U. S. Polishing Lathes (4)
16" Buffalo Motor Spindle Drill, late
6' Cincinnati Bicklord Radial Drill
XA Oilgear Horizontal Broach
No. 354 Niagara Power Slip Roll, late
Chicago Rivet Eyelet Machines, late (4)
No. 4 Cincinnati Vertical Mill
No. 2 Cincinnati Centerless Grinders (2)
No. 1½ Abrasive Surface Grinder, late
50 Ton Henry & Wright Dieing Press

NEW CINCINNATI LATHES AND
ROYAL DRILL PRESSES

MACHINE TOOLS

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LAKE MACHINERY COMPANY
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LATE MODELS
Automatic—1-1/16" Foote-Burt Single Spindle
Automatic—#18A Gerton Swiss Type
Broach—4T24 American Vertical
Drill—#200-26 Defiance Single Spindle
Grinder—6x30 Norton Plain Hydraulic
Grinder—No. 214-30 Besly Disc
Grinder—Rotorex Universal Tool & Cutter
Grinder—M34 Abrasive Vertical Spindle
Grinder—#24A2 Hanchett Vertical Two Spindle
Grinder—#372-53 Besly Wet Horizontal Disc
Lathe—16"x6' Sidney, 16 Speed Head
Lathe—17" LeBlond Rapid Production
Lathe—14"x54" cc Bradford, 12 Speed Head
Mill—36x36x8' Ingersoll Planer Type, 3 Heads
Profiler—12M Morey Two Spindle
Profiler—Red Ring Two Spindle
Tapper—#10 Warner & Swasey Precision
Thread Mill—Model LT Lees Bradner, 6x36
Thread Mill—Model 40A Lees Bradner
Turret Lathe—#0 & #1 B65 Wire Feed
Turret Lathe—#918 Rivett Second Operation

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DOUBLE CRANK PRESSES
No. 3½ BLISS Straight Side Double Crank, Tierod Frame, 42" R to L x 30" F to B, 1½" stroke, AC—MD
225 Ton STOLL Double Crank, Straight Side, Tierod Frame, 108" R to L x 33" F to B, 10" stroke, AC—MD
No. 95F TOLEDO Straight Side, Double Crank, Tierod Frame, 108" R to L x 60" F to B, 8" stroke, 16" shutheight, AC—MD
No. 615D NIAGARA Straight Side, Double Crank, Tierod Frame, 62" R to L x 50" F to B, 4" stroke, AC—MD

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Foote-Burt 2-way Horiz. Drill.
No. 5 Racine 6"x6" H.S. Saw.
Laidlaw 30" Metal Cutting Band Saw
No. 202½ V & O Shell Trimmer.

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Unusual opportunity to procure modern Fellows Gear Shapers 61LA and 6U as well as 12" Gleason Generators, 36 HM Gould & Eberhardt Rougher, 7" Fellows Gear Shaper, #16 Ir. E. Whiton Machine. Write for full information.

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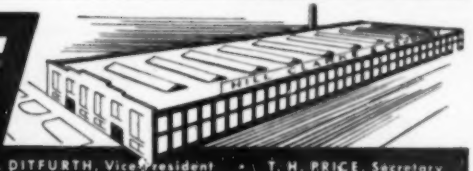

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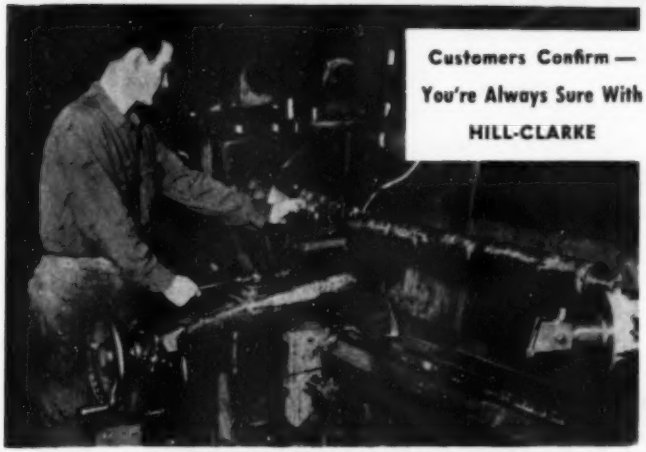

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AUTOMATICS

⅞" G Model Gridley
1" 4 spdl. Greenlee
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
21" Sw Defiance—No. 4 Taper
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 6 Gleason Bevel Gear Tester ('42)
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

Rockford—3⅛" Bar
72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Type C Plain (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
No. 25-A Heald Surface Grinder
5A Bryant Internal
5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 81 Heald Int. Cen.-Sizematic
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 1 Acme 20½" Swing
No. 2H Libby—8⅛" Hole in Spdl.

MILLING MACHINES

No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

24" Milwaukee Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press
No. 175 G. T. Schmidt Marking Mach.
200 Ton Verson Hyd. Press
No. 44 Excello Carbide Tool Gdr.

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36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
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6" Niles Horizontal Floor Type
8 Spindle 10" Bullard Multimatic

DRILLS & RADIALS
S.S. DeSance Drill & Tapper
#25 S.S. Foote Burt with Drill Head
Multi-spindle Davis Thompson Rotomatic
6'15" Cincinnati-Bickford Full Univ. Radial

GEAR EQUIPMENT
12" Gleason Straight Bevel Gear Generator
27" Gleason Gear Planer
24-48 Gould & Eberhardt Gear Hobber

GRINDERS
#4 Brown & Sharpe Universal 14"x90"
#5 Bryant Chucking-Internal
#33 Abrasive 8"x24" Surf. Gr.—Vert. Sp.
8"x48" Jones & Lamson Automatic Thread
#26 Besly Dbl. Opposed
72A Heald Plain Extended Bridge

LATHES
1" Pratt & Whitney Turret
#3 Lodge & Shipley Duomatic
5"x24" Seneca Falls Model U Lo-Swing Shell
20"x112" Lodge & Shipley Cone Head
42"x90" Pond Engine

MILLS
1-10 Sundstrand Rigid Mill
Ingersoll Horizontal Slab
Loes Bradner Thread Mill Model HT

PRESSES
#41 Toledo Horning & Wiring
243-Ton #95-D Toledo
70-Ton #52 Toledo

MISCELLANEOUS
Peerless Universal Shaping Saw
25" Smith & Mills Shaper, Square Ram
6000-6" Baker Hauling Lift Platform
1½" Solat Refr. Co. Plate Shear
#13 Williams & White Punch & Shear
18' Plate (3 rolls) Bending Roll
50 KW Tocco 2-station Unit with starter
4"x18" Foster Superfinisher

AUTOMATICS
#60 New Britain 1" capacity
#146 New Britain 5/16" capacity
5½" 6-Sp. Cleveland Model M Chucker
0"x18" Goss & DeLeeuw
1-1/16 Model B Cleveland

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BAIRD Cut & Carry Drawing Press
#72 HEALD Sizematic
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20½" x 54" Monarch, Engine Lathe, Tracer Control, New 1948

#12 Gisholt Automatic Lathe, New 1943

#8 Sundstrand Automatic Lathe, New 1946

22" x 72" Lehman Heavy Duty Engine Lathe, Taper Attachment, New 1941

1L Gisholt Saddle Type Turret Lathe, Cross Sliding Turret, New 1942

4—#1FU Foster Fastermatics, automatic Turret Lathe, Completely equipped, Air Chuck, Air Cylinder, Turret Tools, Hydr. Cross Facing Attachment, New, 1941

42" Bullard Vertical Spiral Drive Turret Lathe

GRINDERS

72A Heald Universal Internal Grinder, New 1944

2—Norton 6"x18" Type C Cylindrical Grinders, New 1943

#35 Gallmeyer & Livingston Surface Grinder, New 1943

10" x 36" Cinn. Hydraulic Cylindrical Grinder, New 1942

6" x 18" Norton Vertical Surface Grinder, New 1942

6" x 30" Cincinnati Cylindrical Hydraulic Grinder, New 1940

#24L-36 Bryant Internal Grinder, New 1940

#24-26 Bryant Internal Grinder, New 1940

25" x 72" Landis Type C Hydraulic Cylindrical Grinder

MILLING MACHINES

#45-48 Cincinnati Duplex Hydromatic, Milling Machine with Tracer Control, New 1943

Cincinnati 08 Vertical Mill, with Rotary Table, New 1944

12-24 Kearney & Trecker Simplex Mill, New 1942

22L Van Norman Mill, New 1943

33-48 Sundstrand Duplex Mill, New 1940

SHAPERS

#7125A Fellows Gear Shaper, New 1943

#61 Fellows Gear Shaper, New 1943

#72 Fellows Gear Shaper, New 1945

24" Gould & Eberhardt Industrial Shaper, New 1943

PRESSES

Colonial Vertical Press, 10-ton Capacity, 12" Stroke, New 1946

DRILLS

Model C-225H Natco 16-Spindle Multiple Drill, New 1948

2—Barnes Horizontal Way-Type Drills, New 1942

Kingsberry Opposed Type Horizontal Drill, #18 Heads, New 1943

Bausch Radial Drill & Tapper, New 1942

HOBBING MACHINE

140 Cleveland Rigid Hobbing Machine, New 1944

GENERATORS

3" Gleason Straight Bevel Gear Generator, New 1942

2—3" Gleason Spiral Gear Generator, New 1942

HONING MACHINES

249 Barnes Honing Machine with universal table, new 1940

172 Barnes Honing Machine, New 1944

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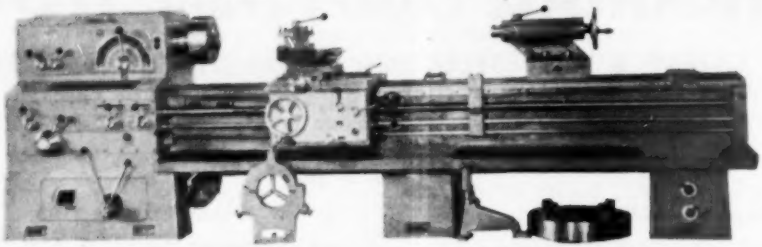
NEW LARGE HEAVY DUTY MEUSER LATHES



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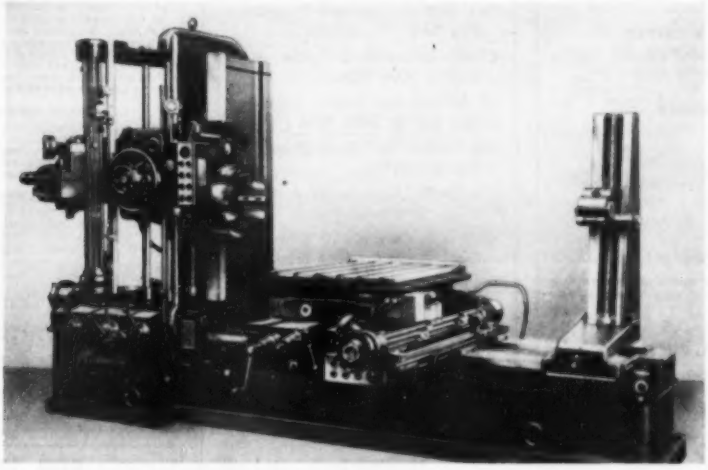

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10'6"x⅛" Cincinnati type. New 1941.

BROACH

12 ton, 32" stroke No. VU 12 Lapointe vertical hydraulic pull up, new 1948.

BROACH GRINDER

No. RG36-51 Colonial round broach grinder, serial No. M 11299, new in 1948.

DRILL

Two No. 7½-A-14 Baker two way hydraulic horizontal with 7½ HP motors. New 1946.

DRILL & TAPPER

Natco two way horizontal hydraulic, indexing fixture, total horsepower 17, new 1947.

GRINDER

10"x18" Landis type C hydraulic, serial No. 25805, new 1942.

GRINDER, INTERNAL

Three No. 24-36 Bryant, new 1941.
One No. 16-28 Bryant, new 1943.

GRINDER, DISC

30", No. 84A Gardner double end opposed disc with hoppe and disc feed, 25 HP spindle motors, new 1938.

GRINDER, SURFACE

12", No. 22 Heald rotary, serial No. 9874, new 1940.

GRINDER, THREAD

No. 33 Excello, new 1943. Now arranged for groove grinding.

HONING MACHINES

No. 172 Barnes, new 1942.

Two No. 2606 Barnes 2 spindle, index tables, new 1938 & 1939.

No. 2610 Barnes, new 1940.

MILLER, THREAD

8"x16" Hanson Whitney, new 1941.

No. CT36 Lees Bradner, new 1941.

MILLER, SPLINE

Two 4", Model M-80 Taylor & Fenn, new 1939 & 1942.

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500 ton Baldwin Southward, 42x52 bed, 20" stroke, 56" daylight. New 1939.

1000 ton Baldwin Southwark, 42x54 bed, 20" stroke, 56" daylight. New 1940.

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- 25A Heald Rotary Surface Grinder, 24" Chuck (1941)
- #4 Warner & Swasey Bar Feed Turret Lathe, Serial #220,000
- 16"x78" American High Duty Lathe, Rapid Traverse, Step Feed, (1938)
- 10" Nat'l Acme Automatic Chucker, 4 Spdl, 11" Elec. Chucks (1938)
- Hilles & Jones #2 Leveling Roll, 10"x86" Rolls, M.D.
- Pels #MK10 Universal Ironworker, Like New, Mtr. Driven
- #1LMS Lel. Giff. 2 Spdle. Bench Drill to 9000 RPM (1941)
- #2 Buffalo Mtr. Spdle. Drill, Pow. Fd., 600 to 3600 RPM (1942)
- #61 Fellows 36" Gear Shapers (2) Ext. & Internal.
- #12 Barber Colman Gear Hobber, Dble. Overarm, Finest
- Pratt & Whitney 10" 2 Wheel Hyd. Gear Tooth Grinder (1943)
- Hones, #2 Micromatic Hydrahone & #172 Barnes Vertical (1943)
- #3A Warner & Swasey Turret Lathe, 4½" Bar Feed
- 24"x24"x6' Liberty Planer, D.C. Rev. M.D., Box Table
- 28" Rockford Openside Shaper Planer

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50" Bullard Vertical Turret Lathe
42" Bullard Vertical Turret Lathe

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14"x8' STAR Engine Lathe
20"x48" AMERICAN Pacemaker Lathe, '42
20"x10' LODGE & SHIPLEY Selective Grd. Hd.
20"x144" centers LoBLOND Geared Head Lathe, 1942

AUTO. LATHES & TURRETS

#3DE POTTER & JOHNSTON Auto. Turret, 1941
#3DB POTTER & JOHNSTON Auto. Turret, 1943
#1NS LIBBY Heavy Duty Turret Lathe

GRINDERS

#104 RIVETT Internal-External Grinder, '42
6"x18" LANDIS Type C Plain Grinder, '42
8"x18" CINCINNATI Plain Saddle Type Grinder
6"x18" NORTON Vert. Spindle Surface Grinder
16"x72" LANDIS Type C Hyd. Pl. Grinder, '42
10"x30" LANDIS Type B Pl. Cyl. with Gap Bed
#16/28 BRYANT Hyd. Internal Grinder, '42
#73 HEALD Internal Centerless Grinder, '43
#TG-185 JONES & LANSON Internal Thread Grinder, new
#3S HEALD Cylinder Grinder

DRILLS

24" CINCINNATI BICKFORD Upright Drill, 1950
32" CINCINNATI BICKFORD Upright Drill
3'9" CINCI. BICKFORD Radial, Gear Box, M.D.
5' REED PRENTICE Radial Drill
#3 NATCO Multi. Spindle Drill—Hyd. table, 1942
#35 ALLEN 3-spindle Hand Feed Sens. Drill
#425 BAKER S.S. Heavy Duty Drill
#2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

#84 FELLOWS Gear Shaper
#12 FELLOWS Gear Shaver, '43
#72SA FELLOWS High Speed Gear Shaper, '42
#36BM GOULD & EBER. Gear Rougher, 1941
36" NORTON Draw Cut Shapers (2), '45

MISCELLANEOUS

15" BETTS Vertical Slotter
#3L LAPOINTE Hyd. Broach, 1945
#½B P&W Two Spindle Reaming Machine, '44
4½"x36" P&W Model C Thread Miller, '43

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King Screw Press, s.p.d.
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4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
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No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
4 spindle 2½" Cleveland Model "K", m.d.
2½" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7½" Cleveland Model A, m.d.
No 8A Cleveland, m.d., 8" cap., latest

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¾" Style R Economy Automatic Threading Machine, belt
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1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, latest
1½" Landis 2 spindle, older type

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Barrett Double End, 5" and 7" spindles, m.d.
3½" bar Landis Floor Type, m.d.
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5½" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.
Pair tables for use on Floor Type Horiz. Boring Mill, 8'9" long x 17½" wide x 36" high, 2 T slots
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Floor Plate consisting of box type Planer Table, 21' long x 48" wide, 12" thick
54"x11' Rectangular Table, 40" high
Rotary Table, 66" dia., made by Ingersoll

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24" Bullard New Era, m.d.
42" Bullard Spiral Drive, m.d.
43" Colburn, m.d., 2 swivel heads
100" Niles Heavy, m.d., p.r.t.

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75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new

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2½' Fondrick, gear box on base
3' American Sensitive, cone
8'-12" col. dia. Drosen, gear box, m.d.
Zeus Precision Universal Bench Type Radials m.d., new

BALL BEARING DRILLS

Canedy Otto Bench Type, 8" overhang
Allen Bench Type, m.d., ½ H.P., 12" overhang
Mason Bench Type Single Spindle, belt
Providence Engineering Co., Model E, s.p.d.
No. ½, I, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fondrick, 8" overhang, belted m.d., No. 2 Taper
No. 5M—16" Fondrick, m.d.
1 spindle Allen, belt drive
2 spindle Allen, belted m.d., 8" overhang
2 spindle Avey, size No. 1, Type B, style VHP, m.d., 8" overhang
2 spindle No. 3 Avey, belted m.d., p.t.
#1LMS—3 spindle Leland & Gifford High Speed, late, m.d.
3 spindle Leland & Gifford Hydraulic, m.d.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
6 spindle Leland & Gifford, No. 2 Taper, m.d., on earth spindle
6 spindle No. 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

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Natco 1 spindle Horizontal Hydraulic Hole Unit, m.d.
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No. 1½Bx36" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x100" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x100" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
3 spindle Detroit Semi-Automatic, belt
Special Horiz. Drilling Machine, Cinti. Bickford Head mounted horiz. on base

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No. 3 Baush, m.d., 20x40" head, 15 spindles
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle 12" Rockford Gang, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
4 spindle Nilos-Bement-Pond, m.d., 14' rail, 5" Taper

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Norton 23x72 High Swing Plain Cylindrical Grinder Mfg. 1943.

Landis 4H 4"x12" Plain Hydraulic Cylindrical Grinder Mfg. 1942.

Heald 25A 24" Rotary Surface Grinder Mfg. 1941.

Ohio Model P Production Mill 36" Table Travel Mfg. 1943.

No. 3 Pian-O-Mill Form and Thread Milling Machine Mfg. 1945.

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H 1 Micromatic Hone 1943.

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#2 Cinc. Vert.
Pratt & Whitney Horiz.
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9"x88" Lo-Swing
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2—9½" Silcole H.D. Saddle type Turret
#2B Foster H.D. Saddle type Turret
#3 Foster Ram Type Turret
#2 A. W. & S. H.D. Saddle Type Turret
#3 A. W. & S. Saddle Type Turret
#6 W.S. Ram Type Turret
#2 Cinc. Acme H.D. Saddle type Turret
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18"x7' Wolcott Engine
16"x80" Shoemaker Boys & Emmes Engine
16"x36" Gray Engine
Foster Hand Turret
W. & S. Hand Turret
24" Gisholt Simplomatic Prod.
24" Nebel Gab bed type
16"x5' Reed Prentice Stub Lathe

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#14 B & S Plain Cyl.
#70 Heald Int.
32" Fitchburg Straight Spline
40" Fitchburg Straight Spline
#33 Excello Thread
Studer Contour
9" Majestic Rotary
10" x 18" Norton Angle Head
#2 Cinc. Centerless
#5 Bryant H.D. Semi-Auto.
#3 & #5 Gardner Double End Jacks
#16 Blanchard Surface Grinder

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Platform Type Elec. Lift Truck
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#7 Zeh & Hahnemann Power Press
Zeh & Hahnemann Power Press
P-3 Ferracute Press
#66 Toledo Punch Press
#9 Zeh & Hahnemann 90 Ton Press
Gleason Quenching Press
Heindrich O.B.I. Press

MISCELLANEOUS

5 Sodi W. & S. Aut. M-2540 Late
1"—4 Spindle National Acme Automatic
#2 Allen Tapper
24"x8' Gray Planer
Gisholt Balancer
Type A1 RR Onsrud, Radial Arm Router
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THOMPSON Model "A" 6"x12"x16" Hydraulic Surface—magnetic chuck—generator set—late.

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GRINDER, 16Y46 Bryant Int., 1943
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GRINDER, SURFACE 14"x36" P. & W.
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HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
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MILLER, No. 1½D K. & T. Univ., Grd. Hd.
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MILLER, UNIV No. 1 Cleveland, M.D.
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PIPE THREADER, 4" Oster, No. 304B, 1947
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PLANER, 36"x36"x14' Woodward, 4 Hds., M.D.
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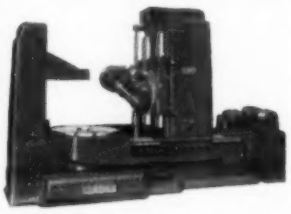

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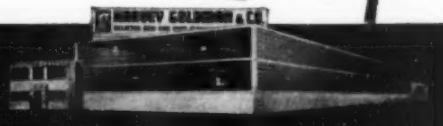

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No. 12 Sundstrand Slusk Lathe. 1942
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Lipe Carbo-Matic. 1942
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M-5 Libby Universal. 1949
No. 2 Warner & Swasey Simplified. 1941
No. 2G Morey. 1942

MILLS, PRODUCTION
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Index of PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 22-23, 30, 196, 232

Accessories & Attachments (Machine Tool) 10-11, 45, 62, 64, 239, 245, 254, 257

Balancing Machines 281

Bearings—4th Cover, 197, 202, 241, 244

Books, Technical 260, 268

Boring, Drilling & Milling Machines (Horizontal) 3rd Cover, 14-15, 20-21, 46, 116

Boring Machines Internal 2nd Cover

Boring & Turning Machines (Vertical) 14-15, 74-75, 271, 304

Broaching Machines 52-53, 56, 233

Brushes 228

Cams 250, 260

Castings 206, 224

Centering Machines 276, 278

Centrifugal Machines 264

Chucks 254, 272, 305

Cleaning & Drying Machines & Supplies 50-51, 95

Collets 45

Controls, Electrical 33, 34, 38, 217, 218

Counters 18

Coolant Systems, Filters & Supplies 212, 225, 238, 255, 280

Cut-Off Machines; Sawing Machines 93, 240, 254, 260, 270

Drafting Room Equipment & Supplies 200

Dressers, Grinding Wheel 35, 159, 179, 277, 278

Drilling Machines 29, 31, 65, 66, 74-75 90-91, 112, 274, 280, 302

Drill Jig Bushings 256

Duplicators & Pantographs 36, 99, 203

Engineering & Production Services 110-111, 215, 221

Fabricating Methods & Services 215, 226, 254

Fasteners 216, 259, 260, 264, 268, 274

Gages & Instruments 16, 31, 47, 159, 191, 274, 278, 307

(Continued on page 302)

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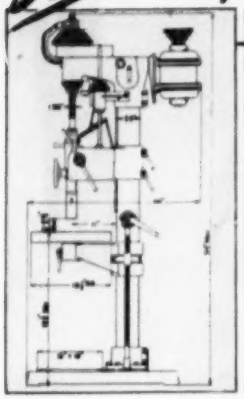

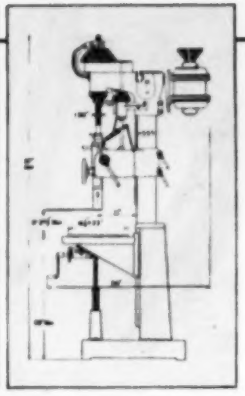

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Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 301)

Gear Cutting Machines ... 3, 6-7, 42-43, 276

Gears, Speed Reducers, Motor Reducers ... 78-79, 189, 211, 227, 229, 235, 250-251

Gear Testers ... 3, 6-7

Grinders—Cutter & Tool ... 12-13, 42-43, 96, 225, 308

Grinding Machines—Production ... 4-5, 12-13, 28, 35, 37, 94, 222, 254, 270, 304

Grinding Wheels ... 22-23, 196, 232, 269

Heads: Drilling, Grinding & Tapping ... 10-11, 73, 258, 272

Heat-Treating Equipment & Supplies ... 19, 84, 187, 208, 255, 280

Honing Machines ... 106, 214, 265, 280

Hydraulic & Pneumatic Parts & Equipment ... 72, 97, 212, 237

Jig Borers ... 250, 256, 277

Lathes, Automatic ... 24-25, 281

Lathes, Engine ... 29, 36, 44, 99, 101, 181, 204, 231, 266

Lathes, Turret ... 24-25, 39, 281

Lubricants, Cutting Fluids, Quenching Oils & Solvents ... 41, 48-49, 50-51, 76, 86-87, 164, 166, 234, 248, 273

Lubricating Systems & Equipment ... 63, 92

Machines, Super Finishing ... 281

Machines, Tumbling ... 267

Marking Machine Tools & Supplies 274

Materials, Cutting & Forming ... 55, 82, 195, 205, 263

Materials of Manufacture ... 162, 193, 197, 247, 259, 261, 263

Materials Handling Equipment ... 17, 236

Mechanical Parts & Equipment ... 62, 64, 239, 245, 257

Millers, Die Sinkers, Profilers ... 8-9, 14-15, 20-21, 77, 306

Motors, Electrical ... 189

Nibbling Machines ... 93

Index of

PRODUCTS ADVERTISED

In This Issue

Oil Purifiers 264, 280

Planers 14-15, 108
Power Transmission 78-79, 185
Presses, Forging & Forming Equipment & Supplies 32, 58-59, 60, 72, 85, 89, 102, 110-111, 187, 198, 201, 215, 220, 240, 242, 246, 247, 254, 256, 268, 272, 275, 278, 279
Pumps, Circulating 54, 238, 262

Riveting Machines 268
Rust Preventives 50-51

Safety & Welfare Equipment 249, 268, 310
Saw Blades 88, 98, 160, 209, 270, 274, 303
Screw Machines; Chucking Machines ..... 3rd Cover, 57, 66, 210
Shafting Flexible 230, 264
Shapers, Slotters, Keyseaters 118, 204, 260, 276
Shop Furniture 221
Spindles, Machine 61
Steel Blue 272

Tapping Attachments 10-11, 74-75, 90-91
Tapping Machines 24-25, 66, 74-75, 274
Thread Cutting Machines 10-11, 77
Tools, Cutting 26-27, 56, 71, 73, 81, 83, 100, 104, 110-111, 115, 207, 220, 222, 233, 243, 276, 301
Tools, Measuring 272
Tools, Portable 80, 230
Turret Attachments, Lathe 45, 239

Universal Joints 238
Used & Surplus Equipment 283-300

Vibration Control 257
Vises 305

Welding & Cutting, Brazing & Soldering Equipment & Supplies 40, 199, 213, 226, 270, 280, 309

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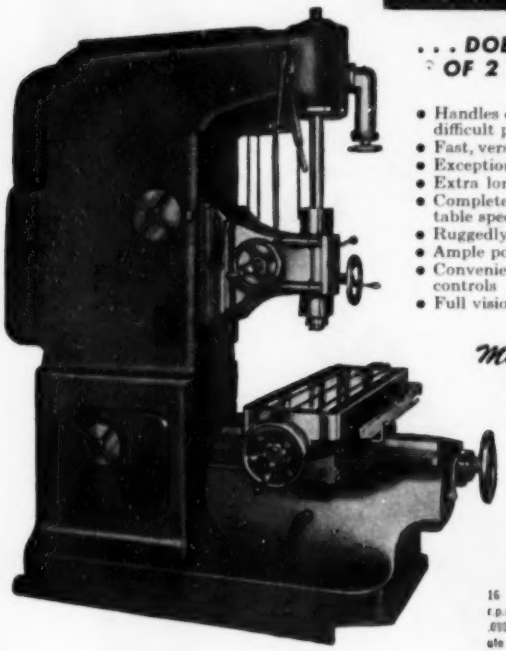

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INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Products Inc.	232
Acromark Co.	274
Adams Co.	250
Air Reduction	237
Alemite	63
Allegheny Ludlum Steel Corp.	82
Allen-Bradley Co.	33, 34
Aluminum Co. of America	259
American Air Filter Co.	225
American Broach & Machine Co.	56
American Chain & Cable Co. Inc.	93
American Optical Co.	249
American Steel Foundries, Elmes Engineering Div.	102
American Tool Works	29
American Welding & Manufacturing Co.	213
Ames Co., B. C.	307
Anderson Oil Co., F. E.	166
Apex Tool & Cutter Co. Inc.	220
Armstrong-Blum Mfg. Co.	270
Armstrong Bros. Tool Co.	64
Arrow Hart & Hegeman Electric Co.	217, 218
Arter Grinding Machine Co.	308
Atkins & Co., E. C.	209
Atlantic Gear Works Inc.	250
Atlas Press Co.	201
Automotive Gear Works Inc.	227
Avey Drilling Machine Co.	112
Baldwin-Lima-Hamilton Corp.	271
Barber-Colman Co.	42-43
Barrett Co., Leon J.	264
Bath Co. Inc., John	81
Bay State Tap & Die Co.	301
Beatty Machine & Mfg. Co.	240
Belgian Electric Sales Corp.	189
Bethlehem Steel Co.	55
Bilgram Gear & Machine Co.	250
Black & Decker Mfg. Co.	80
Blair Tool & Machine Corp.	260
Blanchard Machine Co.	28
Bovar-Schultz Corp.	270
Bradford Machine Tool Co.	204
Brown & Sharpe Mfg. Co.	54
Bryant Machinery & Engineering Co.	44
Buffalo Forge Co.	302
Bullard Co.	62
Bunting Brass & Bronze Co.	197
Campbell Div., Andrew C., Amer. Chain & Cable Co., Inc.	93
Carboloy Co. Inc.	110-111

INDEX TO ADVERTISERS

	Page
Carborundum Co.	22-23
Carpenter Steel Co.	268
Central Safety Equipment Co.	268
Chase Brass & Copper Co., Inc.	247
Chicago Eye Shield Co.	310
Chicago Screw Co.	264
Chrysler Corp. Airtemp Div.	255
Cincinnati-Bickford Tool Co.	65
Cincinnati Gear Co.	250
Cincinnati Grinders Incorporated	4-5
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	118
Circular Tool Co.	222
Clemson Bros., Inc.	303
Cleveland Twist Drill Co.	71
Coffing Hoist Co.	236
Colonial Broach Co.	52-53
Columbus Die Tool & Machine Co.	254
Cone Automatic Machine Co.	57
Continental Tool Works Div. of Ex-Cell-O Corp.	104
Curtis Universal Joint Co.	238
Dake Engine Co.	275
Danly Machine Specialties Inc.	58-59
Davis & Thompson Co.	280
Davis Keyseater Co.	260
Desmond Stephan Mfg. Co.	278
Detroit Broach Co.	115
Disston & Sons Inc., Henry	160
Dodge Mfg. Corp.	78-79
Dow Corning Corp.	162
DuPont de Nemours & Co., Inc., Electrochemicals Dept.	273
Dykem Co.	272
Earle Gear & Machine Co.	250
Eastern Machine Screw Corp.	268
Eberhard Faber Pencil Co.	200
Eisler Engineering Co. Inc.	250
Ellstrom Standard Div. Dearborn Gage Co.	191
Elmes Engineering Div. American Steel Foundries	102
Ex-Cell-O Corporation	104
Fafnir Bearing Co.	241
Farquhar Co., A. B.	198
Farrel-Birmingham Co., Inc.	211
Federal Machine & Welder Co.	309
Fellows Gear Shaper Co.	6-7
Felters Co.	257
Ferracute Machine Co.	60
Fosdick Machine Tool Co.	31
Frantz Co. Inc., S. G.	280
Frauenthal Inc., A. Harold	94
Fulmer Co., C. Allen	214

(Continued on page 306)

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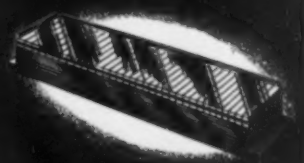

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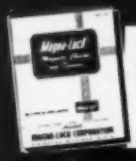

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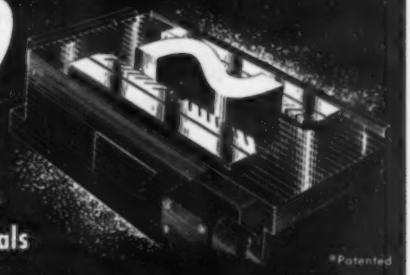

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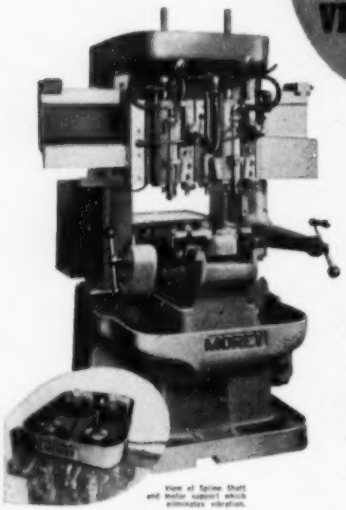

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INDEX TO ADVERTISERS

(Continued from page 305)

	Page
Gallmeyer & Livingston Co.	254
Gardner Machine Co.	37
Gerotor May Corp.	262
Giddings & Lewis Machine Tool Co.	14-15
Gillen Co., John	260
Gisholt Machine Co.	281
Gleason Works	3
Gorham Tool Co.	100
Goss & de Leeuw Machine Co.	210
Grant Mfg. & Machine Co.	268
Grav-I-Flo Corporation	267
Gray Co., G. A.	108
Greenlee Brothers	66
Grip Nut Company	274
Grob Brothers	260
Gulf Oil Corp.	41
Hammond Machinery Builders, Inc.	304
Hanchett Magna Lock Corp.	305
Hardinge Brothers, Inc.	45
Hartford Centerless Grinding Inc.	222
Heald Machine Co.	2nd Cover
Henry & Wright Div. Emhart Mfg. Co.	278
Hones, Inc., Charles A.	280
Hydraulic Press Mfg. Co.	85
J & S Tool Co.	35
Johnson Bronze Co.	244
Jones & Lamson Machine Co.	47
Kearney & Trecker Corp.	20-21
Kester Solder Co.	270
Kingsbury Machine Tool Corp.	90-91
Knight Machinery Co., W. B.	304
Landis Machine Co.	10-11
Landis Tool Co.	12-13
La Salle Steel Co.	205
Latrobe Electric Steel Co.	195
Leland-Gifford Co.	179
Lincoln Electric Co.	199
Lincoln Engineering Co.	92
Link Industries	278
Link-Belt Co.	17
Linley Brothers Co.	256
Lodge & Shipley Co.	36
Lucas Machine Division New Britain Machine Co.	46
Luers, J. Milton	274
Lyon Metal Products Inc.	221
Madison Mfg. Co.	207
Mahon Co., R. C.	226

INDEX TO ADVERTISERS

	Page
Mall Tool Co.	264
Mallory & Co., Inc., P. R.	40
Manheim Mfg. & Belting Co.	185
McGill Mfg. Co.	202
McGonegal Mfg. Co.	225
McGraw-Hill Book Co. Inc.	260
McGraw-Hill Publishing Co. Inc.	252-253
McKay Co.	215
Metal Carbides Corp.	243
Meyers Co. Inc., W. F.	256
Micromatic Hone Corp.	106
Minster Machine Co.	89
Mitts & Merrill	276
Moline Tool Co.	274
Monarch Machine Tool Co.	101
Moore Special Tool Co., Inc.	277
Morey Machinery Co. Inc.	306
Morris Machine Tool Co.	116
National Acme Co.	73
National Automatic Tool Co.	74-75
National Broach & Machine Co.	233
National Machine Tool Co.	204
National Malleable & Steel Castings Co.	206
National Tool Co.	83
National Twist Drill & Tool Co.	27
Nebel Machine Tool Co.	231
New Britain Gridley Machine Co.	3rd Cover
Nilson Machine Co., A. H.	220
Norton Co.	30
Oakite Products Inc.	95
Ohio Crankshaft Co.	187
Ohio Gear Co.	251
Oliver Instrument Co.	96
Orban Co. Inc., Kurt	99
Osborn Mfg. Co.	228
Parker Rust Proof Co.	50-51
Philadelphia Gear Works	235
Plan-o-Mill Corp.	77
Pope Machinery Corp.	61
Pure Oil Co.	76
Racine Machine & Tool Co.	254
Ready Tool Co.	276
Republic Steel Corp.	263
Revere Copper & Brass Inc.	193
Rivett Lathe & Grinder Inc.	39
Robertson Mfg. Co.	269
Rockford Machine Tool Co.	203
Rodgers Hydraulic Inc.	72
Ruthman Machinery Co.	238
Sales Service Machine Tool Co.	242

(Continued on page 308)

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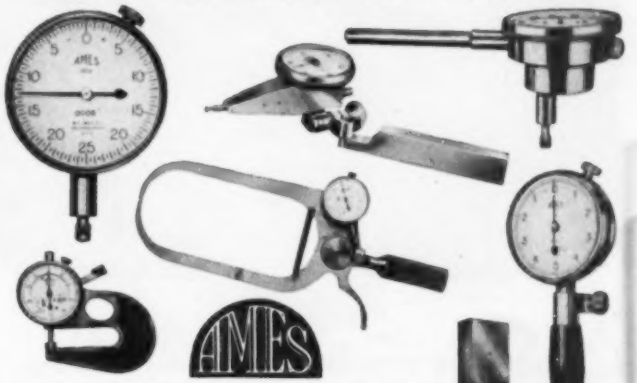

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INDEX TO ADVERTISERS

(Continued from page 307)

	Page
Scherr Co. Inc., George	272
Seneca Falls Machine Co.	245
Sheffield Corp.	159
Shore Instrument & Mfg. Co. Inc.	278
Sidney Machine Tool Co.	181
Simonds Abrasive Co.	196
Simonds Saw & Steel Co.	88
Sinclair Refining Co.	86-87
South Bend Lathe Works	239
Springfield Machine Tool Co.	44
Square D Co.	38
Standard Oil Co. (Indiana)	48-49
Staples Tool Co.	276
Stewart-Warner Corp.	63
Strand Division, N. A.	230
Stuart Oil Co., D. A.	234
Sunnen Products Co.	265
Sun Oil Co.	164
Superior Steel Corp.	261
Surface Combustion Corp.	208
Taco Heaters Inc.	212
Thriftmaster Products Corp.	272
Timken Roller Bearing Co.	4th Cover
Tube Making Machines, Ltd.	256
Unitcast Corp.	224
United States Drill Head Co.	258
V & O Press Co. Div. Emhart Mfg. Co.	268
Van Keuren Co.	16
Van Norman Co.	8-9
Veeder-Root Inc.	18
Verson Allsteel Press Co.	279
Vickers Inc.	97
Victor Saw Works Inc.	98
Vinco Corp.	229
Vlier Mfg. Co.	216
Wade Tool Company	266
Walker Co. Inc., O. S.	254
Waltham Machine Works	276
Warner & Swasey Co.	24-25
Westinghouse Electric Corp.	19
Westinghouse Electric Corp. Electronic & X-Ray Div.	84
White & Bagley Co.	248
Whiton Machine Co.	272
Williams White & Co.	246
Wilson Co., K. R.	32

INDEX TO ADVERTISERS

	Page
Wilson Mechanical Instrument Co.	274
Winter Brothers Co.	26
Zeh & Hahnemann Co.	272

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. HILTY, Manager

EMPLOYMENT — Page
- Positions Vacant ... 282
- Positions Wanted ... 282
- Selling Opportunities Wanted ... 282
- Employment Agencies ... 282
- Employment Services ... 282

SPECIAL SERVICES
- Contract Work ... 282
  - General Pattern Works ... 282
  - Mode Co., P. ... 282
  - Sier-Bath Gear & Pump Co., Inc. ... 282
  - Standard Button Machine Co., Inc. ... 282

BUSINESS OPPORTUNITIES
- Offered ... 282

EQUIPMENT
- (Used or Surplus New)
- For Rent ... 298
- For Sale ... 283-300

WANTED
- Equipment ... 282

ADVERTISERS INDEX

Aaron Machinery Co. ... 287
Alexander & Fiden Machinery Co., Inc. ... 290
Ames Iron Works ... 284
Bennett Machinery Co. ... 298
Botwinik Bros. Inc. ... 284
Botwinik Bros. of Mass., Inc. ... 298
Brownell Machine Tools, Inc., Hazard ... 284
Cowden Machinery Co., D. E. ... 294
Cox Machinery Co. ... 286
Currier Machine Sales ... 292
Dony Machinery Co., D. E. ... 290
Eastern Machinery Co. ... 290
Ecorse Screw Machine Products, Inc. ... 296
Electric Drain Cleaning Co. ... 282
Emerman Machinery Corp. ... 293
Fairfield Equipment Co. ... 288
Falk Machinery Co. ... 283
Federal Fabricators, Inc. ... 292
Foster Machinery Sales Co. ... 298
Goldman & Co., Harvey ... 299
Graff-Pinkert & Company ... 296
Herbert Machine Tool Co., Inc. ... 294
Hill-Clarke Machinery Co. ... 291
Hyman & Sons, Joseph ... 300
Indianapolis Machinery & Supply Co. ... 299
Industrial Plants Corp. ... 294
International Merit Products Corp. ... 295
Interstate Machinery Co., Inc. ... 288
Kings County Machinery Exchange ... 296
Lake Machinery Co. ... 290
Lincoln Machinery Sales Co. ... 294
Lucas & Son, Inc., J. L. ... 288
MacDell Corp., The ... 297
Machinery Rentals Inc. ... 300
MacKenzie Machinery Corp. ... 297
Miles Machinery Co. ... 296, 298
Morey Machinery Co. ... 289
Motch & Merryweather Machinery Co. ... 300
National Machinery Exchange ... 284
Noll Equipment Co. ... 292
O'Connell Machinery Co. ... 284, 290
Osborne & Sexton Machinery Co. ... 299
Pauls Machinery Co. ... 286
Production & Equipment Co. ... 300
Rice & Company, Inc., Robert W. ... 296
Schobe Equipment Co., The ... 288
Smith Machinery Sales, Ed. ... 298
Standard Steel Corp. ... 282
Triplex Machine Tool Corp. ... 285
U. S. Industrial Tools ... 292
United Machinery & Tool Corp. ... 286
Victor Machinery Exchange ... 294
Wabash Employment Agency ... 282
West Penn Machinery Co. ... 300
Wigglesworth Industrial Corp. ... 296
Wigglesworth Machinery Co., T. R. ... 290
Williams Patent Crusher & Pulverizer ... 292
Winston Machinery Company, Inc. ... 292, 300

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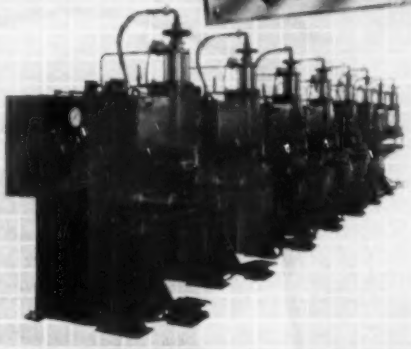

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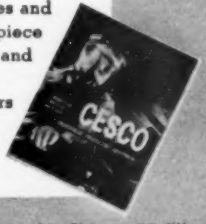

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THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Simmons switches to TIMKEN® bearings, gets more accuracy in 6″ boring and facing machine

WHEN the Simmons Machine Tool Corporation redesigned their old, plain bearing 6″ horizontal boring and facing machine they wanted it to work to the closer tolerances required today.

To insure the spindle rigidity which would make accurate machining possible, Simmons engineers mounted the machine's boring bar sleeve spindle on Timken® precision bearings. Timken bearings are also used in the following applications: boring bar steady rest, saddle feed assembly, worm gear shaft, feed sprocket shaft, input shaft, first and second intermediate shafts.

Timken precision bearings are made specifically for precision spindle applications. "Double Zero" bearings are available with run-out tolerances of 75 millionths of an inch or less.

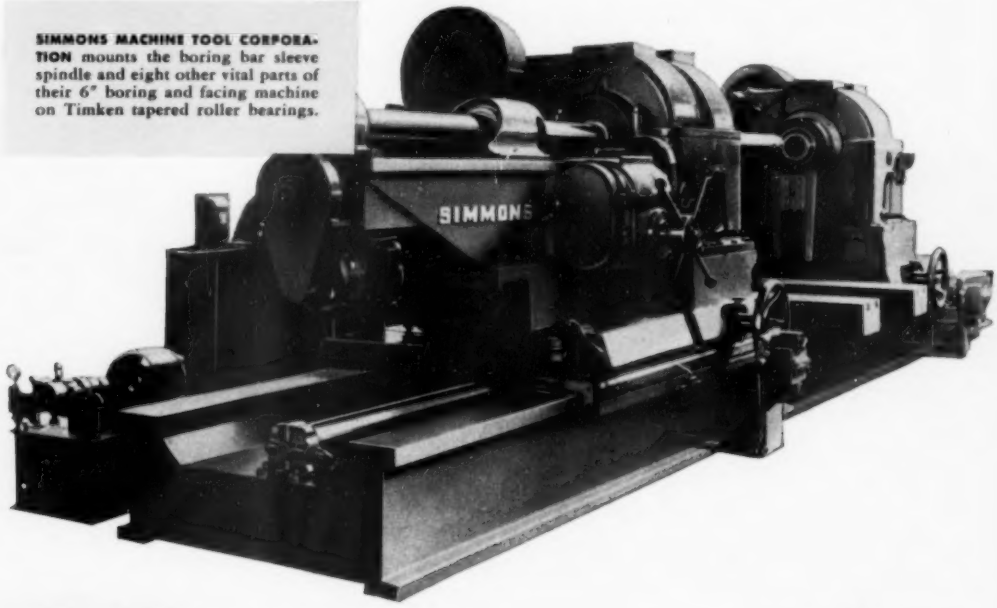
Because of their tapered design, Timken bearings permit pre-loading to any desired degree, preventing chatter. Because of line contact between Timken bearing rollers and races, there's more than enough capacity for any tool load.

Timken bearings reduce machine tool manufacturing costs too. Assembly and set-up of the bearings are quick and easy. No special thrust bearings are needed.

No other bearing offers you all the advantages that Timken bearings do. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

SIMMONS MACHINE TOOL CORPORATION mounts the boring bar sleeve spindle and eight other vital parts of their 6″ boring and facing machine on Timken tapered roller bearings.



FINISHED TO CLOSER TOLERANCES

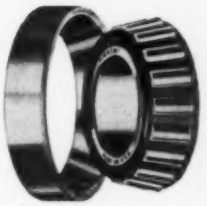
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬮ AND THRUST ⟷ LOADS OR ANY COMBINATION ⊛